The Scientific Review,

AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

INCORPORATING THE

Journal of the Inventors' Institute.

[REGISTERED FOR TRANSMISSION ABROAD.]

[ALL RIGHTS RESERVED.]

Vol. XIII.—No. 11.] NOVEMBER, 1878. [Price 6d.

[THIRD SERIES.]

⁂ *Communications to the Editor to be addressed to him at 21, Cockspur Street.*

CONTENTS.

PAGE

Advertisements 157

Index of Applications for Patents 157

Reviews—

Bourne on the Steam Engine 160

Domestic Medicine 160

Baldwin Latham's Sanitary Engineering... 161

North Wales................................ 161

Theory of Sound.............................. 161

Messrs. Cassell's Publications 161

Collisions at Sea 162

Improved Steam Fire Engine.................. 163

PAGE

Foreign Science.................................. 163

Large Driving Belts 163

Cheap Illuminated Clock 163

Gas Light 163

Proceedings of the Institute.................. 164

Monthly Notices 164

Lighting in the Future 165

Proceedings of Societies—

Entomological Society 166

Numismatic Society.............................. 166

The British Association 166

PAGE

Poisonous and Non-Poisonous Paints and Wall Papers 168

Wax-producing Plants.......................... 169

Curious Astronomical Phenomenon...... 169

Safety in Mines 169

Solidification of Petroleum 169

Hymettus 169

Recent American and Foreign Patents... 170

Absorption and Excretion of Water 171

Advertisements 172

NOTICE.

Mr. F. W. CAMPIN, Barrister-at-Law, Secretary of the Inventors' Institute, can be addressed at Talfourd Lodge, S.E., or 46, Southampton Buildings, Chancery Lane, London.

THE INVENTORS' INSTITUTE

4, St. Martin's Place, Trafalgar Square.

President—**SIR ANTONIO BRADY.**

The qualification for Annual Members of the Institute is a yearly Subscription of One Guinea, and for Life Members a single payment of Ten Guineas. See advertisement at back.

Persons desirous of becoming members are requested to forward their names and addresses to the Secretary.

THE

INVENTORS PATENT-RIGHT ASSOCIATION.

LIMITED.

21, Cockspur-street, Charing-cross,
London, S.W.

THOMAS MORGAN,
Secretary.

DESIGN & WORK.

AN ILLUSTRATED JOURNAL OF INVENTIONS, MANUFACTURES, SCIENCE, AND ART.

Devoted to the advancement of the Exact Sciences; to Chemistry in the Class and the Laboratory.

To the Use of Tools in the Workshops of Amateur and Professional Workers.

The Progress of Electro-Metallurgy.

The Microscope and its Accessories.

The Lathe and its Uses.

Watch and Clock Repairing.

Physical Science in general, with Phiography, Telephony, and Phonography.

The Organ, Violin, Harmonium, and other Musical Instruments.

Electricity and Electrical Apparatus.

Astronomy and Astronomical Apparatus.

New Inventions and Improvements in Machinery of every description.

Intercommunication between readers on all subjects of genuine interest, &c., &c., &c.

WEEKLY, 2d.; MONTHLY PARTS, 9d.

Office

41, Tavistock St., Covent Garden, W.C.

Recently Published, price 2s.,

THE LAW OF PATENTS FOR INVENTIONS. By F. W. Campin, of Gray's Inn, Barrister at Law.

London Lockwood, Stationers' Court.

THE

INVENTORS' & GENERAL AGENCY

(LIMITED).

76, CHANCERY LANE, LONDON, W.C.

Investors and Inventors are invited to apply for the Prospectus and Circular of this Agency.

Andrew Glendinning, Secretary.

SMARTT'S PATENT WATERPROOF CEMENT

Should be in every House and Place of Business, ready for covering and rendering more durable or for repairing, the soled of Boots, the bottoms of Cans (for cold water), and other such movable vessels, for repairing and improving Water Casks and other vessels and utensils, and for cementing generally.

Sold by Grocers, Ironmongers and others.

Supplied wholesale only by

WALTER SMARTT, Buckhurst Hill, London, N.E.

THE

NEW YORK "MINING RECORD,"

A Weekly Newspaper Representing the

MINING INTERESTS OF NORTH AMERICA.

60, BROADWAY, NEW YORK.

CONTAINING Full and Correct Special Letters from Mining Districts and Reports of all Mining Operations in the United States, Prices of Mining Stocks, Descriptive List of Mining Companies, Dividends, Newly-Devised and Patented Machinery for Mining, &c. &c.

Subscription to English Subscribers, Sixteen Shillings per Annum, postage free.

An Excellent Medium for Advertising Mining and Financial Matters—Terms forwarded.

London Offices—3. Catherine Street, Strand, W.C
and 53, Great Tower Street, E.C.

Now ready, price 2s. 6d., cloth,

HANDY BOOK OF THE LABOUR LAWS.

By GEORGE HOWELL,

(Late Parliamentary Secretary to the Trades Unions Great Britain.)

14, FETTER LANE, LONDON, E.C.

RECENT PATENT CASES.

Now Ready, price 3s., the First Appendix to an ABSTRACT OF PATENT CASES, continuing the above work from July, 1876, to December, 1877, by T M Goodeve, M.A., Barrister-at-Law.

H. SWEET, 3, Chancery Lane.

SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

September 20th to October 20th, inclusive.

The following Index gives first the class, then the name of the Inventor, and the No. of the Patent. In this list (com.) means Invention communicated from abroad. Further information as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur Street, Charing-cross.

Acids and Vinegar.—C. Norrington, 4131.

Advertising; Advertisements.—J. L. Blackmer, 3750. B. P. Daniels, W. R. Hopcraft, and C. James, 4018.

Air, Gas, and Wind Engines, and Mills, &c.—G. W. Weatherhogg, 3972. S. Pitt (com.), 4056.

Air and Gases (Purifying, Forcing, Exhausting, and Compressing.—J. H. Johnson (com.), 3917. S. Pitt (com.), 4056.

Alkalies, Alkaline, Earthy Salts.—H. Gaskell, 3783. C. M. Sombart (com.), 3844. J. H. Johnson (com.), 3917. J. Imray, 3967. G. Glover, 3973. J. C. Stevenson, 4148.

Asphalte, Tar, Pitch, &c.—E. G. Brewer (com.), 3900. C. F. Sebille, 3920.

Axles, Shafts, Bearings, Journals, Axle Boxes, Packing for Axles, Lubricating Axles, &c.—A. H. Lee, 3901. W. R. Lake (com.), 3902. W. R. Colbourn and W. Somers, 4025. E. G. Colton (com.), 4040. C. D. Goubet, 4080.

Bags, Portmanteaus, Sacks, Holders, &c.—W. F. Williams, 3745. W. H. J. Grout, 3749. L. Autra, 3792. S. Pitt (com.), 4149. A. Mitchell, 4154.

Bands, Belts, Straps, Chains, &c., for Driving Machinery.—W. W. Cobbett (com.), 4038. J. Heap, 4115.

Bells, Ringing Bells.—T. Casson, 3774. C. Smith, 3816.

Belts, Braces, Girths, and Bands for Wear.—B. Hunt (com.), 3845. A. J. Goulstone, 4142. A. R. de Silva Ferro, 4150. W. Harvie, 4185.

Bobbins, Spools, and Reels.—F. Wirth (com.), 3857. J. W. Wilson, 3966 J. H. and L. Wilson, 4110.

Books, &c.—F. H. Stiff, 3764. F. Wirth (com.), 3793. O. Scholzig (com.), 3949.

Boots, Shoes, Leggings, Cleaning Boots.—H. J. Haddan (com.), 3781. A. Cridland and D. Rose, 3852. E. P H. Vaughan (com.), 3883. F. B. Locky and W. H. Smyth, 3946. W. H. Dorman, 4008. J. W. Jones, 4117. P. B. Elwell, 4126. N. Melachrino, 4181.

Boring, Drilling, and Rifling, Gimlets, and Augers —E. G. Reuss, 4152.

Bottles and Jars, Bottle-holders, Bottle-stoppers, Capsules and Corks.—L. Vallet, 3807, P. O'Grady (com.), 3835. E. P. Alexander (com. 3868. G., G. W., and J. Betejmann, 4012. F

G. Riley, 4051. G. Evenden and H. W. Stiles, 4105.

Boxes, Trunks, Portmanteaus, Letter-boxes Workboxes, Dressing Cases, Canisters.—H. Hughes, 3739. R. Hudson, 3782. D. Whyte, 3805. T. G. Thompson, 4159.

Bread, Biscuits, and Pastry, Bakers' Ovens.—H. Brierley (com.), 3760.

Breaks, Skids, and Buffers for Carriages and Railways.—G. Westinghouse, [illegible]. F. W. Eames, 4172.

Brewing, Fermenting, Making Fermented and Unfermented Beverages, &c.—F. Gretton, 3896. N. D. Garrett and J. S. Lederer, 4024. A. H. Hassall and O. Helmer, 4028.

Bricks, Tiles, and Building Blocks.—W. R. Lake (com.), 3769. C. H. Murray, 3820. J. Ryder, 3958. H. W. Hart, 3962. W. B. Ensor, 4045. S. G. Thomas, 4063.

Bridges, Viaducts, and Aqueducts.—H. Lockwood, 3861.

Brushes and Brooms.—A. M. Clark (com.), 3758. H. W. Gosling, 3839. R. H. Brandon (com.), 3948. G. Russum, 4010. W. North, 4041.

Building, Plastering, Flooring, Roofing, &c.—G. Herridge, 3735. J. Herrington, 3830. S. C. Hemming, 3875. G. Anstey, 3957. W. Chippendale, 4156.

Buoys, Marine Lights, Preserving Life and Property at Sea, Conveying Lines to Stranded Vessels.—H. Kennard, 3737. L. Antra, 3792. A. W. Birt, 3821. B. Hunt (com.), 3845. P. O'Carroll, 3887. P. K. Seddon, 4096. A. J. Goulstone, 4142. D. R. de S. Ferro, 4150.

Buttons, Buckles.—M. Lowenstein, 3766. P. O'Grady (com.), 3855. H. J. Haddan (com.), 3860. C. Cawley and E. S. Newcombe, 3968. P. Y. S. Bulot, 4085.

Calculating, Teaching, Solving Problems.—J. and J. Wilson, 3806. J. P. Hawtrey, 3823.

Calendars.—F. Wirth (com.), 4067.

Candles, Tapers, and Wicks; Night-Lights, Candlesticks.—E. G. Brewer (com.), 3784.

Cards, &c.—R. Douglas, 3995.

Carriages, Cabs, Omnibuses, Waggons, Carts, Trucks, &c.—A. M. Clark (com.), 3767. A. M. Clark (com.), 3771. R. Hudson, 3782. H. and R. J. Pope, 4162.

Cartridges, &c.—S. B. Allport, 4098.

Casks and Barrels, Cask-stands, Filling Casks.—R. Hudson, 3782. W. Shanks, 3864. D. Cope, 3964.

Casting and Moulding Plastic Materials, &c. J. Ryder, 3958. R. M. Callinoham, 4013. W. B. Ensor, 4045.

Cement, Plaster, Mortar, and Concrete, Adhesive, and other Cements.—J. Hart, 3798. A. Rowan, 4019.

Centrifugal Machines.—C. D. Abel (com.), 4017.

Chains, Chain Cables, &c.—J. Glover and H. Gosnell, 3770. C. B. Welin, 3888. T. Winkles and T. Moxon, 4069.

Charcoal, &c.—R. M. Callingham, 4013. J. W. Aronson and H. B. Farnie, 4163.

Cheques, &c.—A. A. Usher, 3967. E. Packman (com.), 4092.

Churns, &c.—G. W. von Nawrocki (com.), 4092.

Cisterns, Reservoirs, and Tanks.—R. Hudson, 3782. W. Buck, 3996.

Clocks, Watches, and other Timekeepers; Watchkeys.—T. Casson, 3774. P. O'Grady (com.), 3835. R. H. Brandon (com.), 4007. F. Wirth (com.), 4067. T. Winkles and T. Moxon, 4067. F. Wallen, 4090.

Coating, Covering, Plating, Sheathing.—H. B. Barlow (com.), 3842.

Coffee, Cocoa, and Tea.—D. Rushworth, 3803. T. G. Thomson, 4159.

Combs.—J. Hickisson, 8809. J. L. Nelson, 3891.

Compasses (Magnetic).—C. D. Abel (com.), 3738. F. H. F. Engel (com.), 3855.

Confectionery.—J. and J. Wilson, 3806.

Cooking and Apparatus used in Cooking.—W. R. Lake (com.), 3791. J. I. Parkes, 4103.

Cutting, Sawing, Planing.—J. R. Schram, 3764. A. M. Clark (com.), 3722. S. Williams, 3931. W. R. Lake (com.), 5938. L. Varicas (com.), 3980. L. Varicas (com.), 3981. L. Varicas (com.), 3985. J. R. Drake and R. Muirhead, 4077. J. H. Johnson (com.), 4087. W. W. Urquhart and J. Lindsay, 4122.

Cylinders and Rollers, Covering Rollers.—A. Clifford, 3928.

Doors and Gates, Door Furniture.—S. Adams, 3815. C. Smith, 3816. C. B. Welin, 3888. S. A. Say, 3990. J. S. Foster, 4182.

Drains, Sewers, Gutters, Drain-pipes and Tiles, Drainage, Stenchtraps, Sinks.—G. A. Heron, 3898. G. and G. Jennings, 4112. H. K. Bromhead, 4120.

Dresses, Ladies' Underclothing, Petticoats, Skirts, Dress Suspenders, Stays, Bodices, &c.—A. L. Fyfe, 3818. H. J. Jordan, 3863.

Dyes, &c.—W. A. Barlow (com.), 3822. W. A. Barlow com.), 4015.

Electricity, Galvanism, and Magnetism, and their Application.—J. L. Blackmer, 3750. S. F. von Choate, 3924. M. R. Ward, 3976. S. G. L. Fox, 3988. R. H. Brandon (com.), 4007. W. North, 4041. S. G. L. Fox, 4043. J. Imray (com.), 4066. A. Arnaud, 4074. J. H. Johnson (com.), 4075. J. L. Pulvermacher, 4994. F. H. W. Higgins, 4095. F. H. Varley, 4100. E. J. Welch, 4114. W. Scott, 4140.

Embossing, &c.—H. Lowenberg, 4151.

Engraving.—C. Bollisevener and E. Herdenham, 4146. H. Lowenberg, 4151.

Fabrics, Elastic Fabrics.—H. J. Jordan, 3863. M. M'Callum, 4083. H. Lowenberg, 4151.

Felt, &c.—N. Procter, 4111.

Fences, Railings, &c.—G. and E. Woods, 3971. T. Ellis, 4035.

Fibres (Obtaining and Treating).—P. Kelly, 3735. J. Taylor, 3767. W. Henderson, 3871. E. Crossley, S. Matthews, and J. Marsden, 3908. E. G. Colton (com.), 4040. B. A. and W. Dobson and J. Newhouse, 4055. H. J. Haddan (com.), 4167.

Filters; Filtering, Purifying, and Clarifying Liquids, Distilling Water, Softening Water.—W. White, 3746. G. E. Haycroft and E. Johnson, 2748. E. G. Colton (com.), 4040. A. R. and J. W. Harding, 4070. H. K. Nelson, 4120. J. C. Copley, 4170.

Finishing and Dressing Fabrics, &c.—W. Holt, 3913. A. M. Clark (com.), 3952. N. Procter, 4111. J. Stordy and F. Hampson, 4166.

Fire-arms, Guns, Ordnance, Gun Carriages. Targets, Rifle Practice.—A. M. Clark (com.), 3878. J. Mathews, 3929. G. M. Lowe (com.), 4107.

Fire-engines, Fire-Escapes, Extinguishing Fires.—V. Herridge, 3755. T. F. P. M. Kavanagh (com.), 3846 T. Vann, 3895. J. B. Clement and L. V. Pierley, 3922. W. Young, 3933. G. Bernheim, 4089. D. Fergusson, 4121. J. R. J. Foster and M. C. Greenhill, 4184

Fire Places, Stoves and Ranges, Fenders and Fire-Irons.—C. Gill and F. Northcott, 3767. J. M'Millan, 3919. J. M'Millan, 3945. J. Stordy and F. Hampson, 4166.

Fireproofing, Rendering Uninflammable.—T. G. Thomas, 3975.

Flues and Chimneys, Chimney Tops, Cowls, &c.—A. Mill and R. Scotland, 3881. J. B. Clement and L. V. Pierley, 3922. S. H. A. J. and W. E. Taylor, 4099. E. Church, 4183.

Furnaces and Fire-boxes; Supplying Furnaces with Fuel.—C. Gill and H. Northcot., 3736. A. M. Clark (com.), 3789. J. M'Millan, 3919. J. M'Millan, 3945. G. L. Scott, 3947. S. G. Thomas, 3975. L. Varicas (com.), 3984. F. W. Ashton, 4002. W. Hackney, 4097. W. R. Lake (com.), 4137.

Furniture.—J. Jackson, 3765. S. Adams, 3815. A. W. Birt, 3821. F. W. Applegarth, 3699. W. R. Lake (com.), 4014. C. J. Gny, 4123. A. J. Goulstone, 4142. D. Ramonde Silva Ferro, 4150.

Games and Exercises, Billiards and Bagatelle Markers and Indicators for Games.—J. and J. Wilson, 3806. W. P. Gregg, 3817. R. Douglass, 3995.

Gas, Gasometers, Holders, and Retorts.—W. R. Lake (com.), 3768. S. Cutler, 3915. W. Carsons, 3925. J. E. Dowson, 3997. A. M'Dougall and J. Hepworth, 4003. W. Hackney, 4097.

Gas and other Burners, and Regulators, Gas Fittings, Lighting and Extinguishing Gas, Preventing Escape of Gas.—A. Wilkinson and W. Wellings, 3853. F. Wirth (com.), 4102.

Gauges, Water-level Indicators.—A. and C. Stewart, 4005.

Glass and its applications.—H. B. Barlow (com.), 3842. F. W. Webb, 4039.

Governors for Engines and Machinery.—E. G. Colton, 3751. C. M. Sombart (com.), 3780. W. Smith and R. Wall, 3814. W. E. Flicker, 3979.

Grain and Seeds (Treating).—H. Cutler, 3829. R. Davison, 3872. F. Thompson and W. Williamson, 4138.

Grinding and Crushing Corn, Grain, and Seeds, and Dressing Flour.—P. Jensen (com.), 3763. J. W. Throop (com.), 3840. W. R. Lake (com.), 3938. C. Pieper (com.), 4033. F. Thompson and H. Williamson, 4138. H. J. Haddan (com.), 4153.

Grinding, Crushing, and Pulverizing Miscellaneous Substances.—W. Rowlandson, 3825. W. H. Baxter, 3914. J. O. Mesnier (com.), 3998. D. Gray, 4001. C. Pieper (com.), 4033. M. Coulson, 4050. J. and C. E. B. Cooke and G. Hibbert, 4068.

Grinding, Sharpening, &c.—L. Varicas, 3980. B. A. and W. Dobson and J. Newhouse, 4055. P. Elwell, 4126. J. W. Logan and W. Elder (com.), 4141.

Gutta-Percha and India-Rubber (Treating and Applying).—W. H. Bates, G. Bidlake, and H. Faulkner, 3799.

Hair Dressing.—J. Hickison, 3809. A. M. Clark (com.), 3936. W. North, 4041.

Hammers, &c.—J. W. Plunkett, 3939. A. Davy, 4135.

Harness, Saddles, Curbs, Whips, Releasing from Harness, Grooming Horses, Nosebags.—A. M. Clark (com.), 3757. E. P. H. Vaughan (com.), 3883.

Hats, Caps, Bonnets, &c.—W. E. Carrington, 3753. T. Townsend, 3795. W. L. Bigelow, 3880.

Heating, &c.—W. R. Lake (com.), 3791. D. Rushworth, 3803. A. Wilkinson and W. Welling, 3853. H. and J. Bell and J. J. Coleman, 3862. J. H. Johnson (com.), 4030. S. G. L. Fox, 4043. W. R. Lake (com.), 4137.

Hinges.—S. Adams, 3815. C. L. Boyce, 3831. W. Pavely, 3942.

Hoists, Cranes, Capstans, Windlasses, Raising, Lowering, and Moving heavy bodies, Raising from Mines.—J. Daglish and H. Lawrence, 3812. J. A. Westerman, 4091. C. Kesseler (com.), 4104.

Hoops and Rings.—A. Burgess, 3787. H. Payton (com.), 3894.

Horse Shoes, Shoeing Horses.—A M. Clark (com.), 3849. G. C. Hopper (com.), 4078.

Inks and Inkstands.—J. W. Addy, 4169.

Jewellery, &c.—A. Burgess, 3787. H. Payton (com.), 3894. T. Winkles and T. Moxon, 4069.

Jugs, &c.—F. Cadby, 3832.

Knives, Forks, and Spoons.—A. M. and H. Warner, 3838. H. B. Fox and J. Gamlin, 94

Ladders.—T. Vann, 3895.

Lamps, Lanterns, Chandeliers, Candlesticks, Lamp Furniture, Glasses and Shades, Lighting, Producing Light.—F. E. Merry, 3788. A. Longsdon (com.), 3837. A. Wilkinson and W. Willings, 3853. G. Seagrave, 3890. W. S. Wilson, 3912. W. R. Lake (com.), 3937. Sir H. V. Tyler, 3985. S. G. L. Fox, 3988. J. Clark, 3991. P. Jensen (com.), 4006. J. Munro, 4016. J. W. T. Cadett, 4022. A. M. Clark (com.), 4031. S. G. L. Fox, 4043. G. P. Harding, 4046. G. P. Harding, 4047. J. Williams (com.), 4058. A. Arnaud, 4074. J. L. Pulvermacher, 4079. P. K. Seddon, 4096. F. H. Varley, 4100. E. J. C. Welch 4114. G. Forbes, 4116. A. S. Hickley, 4132. W. Scott, 4140. J. N. Aronson and H. B. Farnie, 4163. J. L. Pulvermacher, 4180.

Leather, Skins, Hides, Artificial Leather and Parchment, Currying, Tanning, Cutting, and Ornamenting Leather.—E. P. H. Vaughan (com.), 3883. A. J. Le Blanc, 4049. J. Baird, 4086. H. Lowenberg, 4151.

Locks, Latches, Bolts, Lock Furniture, Keys.—P. O'Grady (com.), 3835. C. B. Welin, 3888. S. A. Say, 3990 J. S. Foster, 4182.

Looking Glasses, Mirrors.—S. Adams, 3815. H. M. Williams (com.), 3877.

Mangling, Ironing, Goffering, &c.—T. Bradford, 3826. J. L. Burchell, 3899. W. H. Farmer, 3986.

Manure; Treating Sewage.—H. K. Bromhead, 4120.

Matches, Fuzees, &c.—V. Nicolardot, 4004.

Mathematical and Philosophical Instruments.—J. Ryan, 3927. W. Kimberley, 3955. D. Fergusson, 4121.

Medicines, &c.—C. Beanes, 3884.

Metals; Smelting, Extracting and Reducing Metals, Heating Ores, Refining, Tempering, and Annealing Metals, Manufacture of Iron and Steel, Metallic Alloys.—J. H. Johnson (com.), 3850. D. Bateman, 3911. G. L. Scott, 3947. W. H. Taylor, 3953. S. G. Thomas, 3975. S. A. Peto, 3992 N. Cordier, 3993. S. G. Thomas, 4063. W. Scott, 4118.

Metals; (Casting and Moulding).—W. H. O. Taylor and J. Wailes, 3819. W. H. O. Taylor, 3953. W. H. O. Taylor and J. Wailes, 4009.

Metals: Forging, Rolling, Hammering, Rivetting, Bending, Welding and Shaping Metals, Steam Hammers, Anvils.—A. M. Clark (com.), 3790. A. Clifford, 3928. W. R. Colborn and W.

Somers, 4025. J. I. Parkes, 4103. A. Davy, 4135.

Metals; Cutting, Planing, &c.—A. M. Clark (com.), 3772. A. M. Clark (com.), 3790. W. W. Urquhart and and J. Lindsay, 4122.

Metals; Plating and Coating Metallic Surfaces with Metals, &c.—H. B. Barlow (com.), 3842.

Meters for gas and fluids.—S. Pitt (com.), 4056.

Mining, Boring and Blasting Rock, Raising from Mines, Getting Coals, Draining, Lighting, and Ventilating Mines.—J. R. Schram, 3754. J. Daglish and H. Lawrence, 3812. A. H. Maurice, 3905. W. Young, 3933. J. D. Treharne and E. Jones, 3954. E. G. Reuss, 4152.

Mixing, &c.—M. D. Macdonald, 3851.

Motive-power Machines, Obtaining Motive-power.—W. Muret, 3843. J. W. Hill, 3943.

Muffs, Boas, Victorines.—A. C. Henderson (com.), 4036.

Musical Instruments.—G. Chiappa and G. Fersani, 3743. M. Gally, 3876. R. J. Rae, 4042. G. F. Redfern (com.), 4059.

Nails, Spikes, Bolts, Rivets, Screws, &c.—C. Iliffe, 3778. E. T. Peliam, 3989. G. C. Hopper (com.), 4078.

Noxious Gases (Preventing and Arresting).—G. A. Heron, 3898.

Nuts and Washers.—C. Iliffe, 3778. W. R. Lake (com.), 3813. J. B. Boyce, 4060. J. S. Stony and F. G. Lynde, 4124.

Oiling or Lubricating, &c.—C. Pieper (com.), 4034. C. de Nottbeck, 4113.

Oils, Fatty Matters, Grease.—R. Davison, 3872.

Optical Instruments.—G. W. von Nawrokci (com.), 4032. E. M. T. Tydeman, 4062.

Ornamenting.—J. Harrington, 3830. H. B. Barlow (com.), 3842.

Ovens and Kilns.—W. Brierley (com.), 3760.

Packing, Packing Cases, Arranging Goods for Sale.—D. Cope, 3964. C. G. Emery, 3977. G. Kearsley and E. Whitworth, 4026. L. Turner, 4072.

Packing Pistons, &c.—E. M. B. Faull, 3786.

Paints, Colours, Varnishes, Glazes and Lacquer; Painting, Colouring, and Varnishing.—W. A. Barlow (com.), 3741. A. M. Clark (com.). 3758. J. Russum, 4010.

Paper, Pasteboard and Papier Mâche; Paper Hangings.—W. S. Gedge and C. Hayward, 3963. J. and C. E. B. Cooke and G. Hibbert, 4068. J. H. Johnson (com.), 4087. H. J. Haddan (com.), 4167.

Patterns, Designs, Models.—G. Stephenson, 3828.

Pens, Penholders, Pencils, Pencil Cases.—F. Doffett, 3733. J. Peacock, 3810. J. H. Hilton, 3909. A. H. Woodward, 4057. J. W. Spear, 4064.

Photography and Photographic Apparatus.—J. T. Lane, 3941. J. B. G. Bounand, 4023. G. W. von Nawrocki (com.), 4032. C. Bolckoevener and E. Heidenhaus, 4146.

Pictures, Portraits, &c.—A. H. Coningsby and J. Grover, 3785. J. B. G. Bounaud, 4023.

Pipes, Tubes and Syphons; Joining Pipes.—C. M. Sombart (com.), 3740. J. Waddington, 3808. P. Emanuel, 3867. G. A. Heron, 3898. A. Clifford, 3928. W. R. Lake (com.), 4137. A. Gunthorpe and B. Henoch, 4171.

Pistons, &c.—S. Pitt (com.), 4056.

Plants, Trees, Seaweeds, &c.—J. Glover and R. H. Gosnell, 3770. J. A. Drake and R. Muirhead, 4077.

Ploughing, Digging, Clod Crushing, Land Rolling, Harrowing, Agricultural Implements, Tilling and Cultivating Land.—T. Perkins and T. Burall, 4179.

Preserving and Preparing Articles of Food.—E. Beanes, 3884. A. Barr, 4000. T. D. Pruday, 4044.

Presses; Compressing.—C. M. Sombart (com.) 3740.

Printing and Transferring; Type and other Surfaces for Printing, Composing, and Distributing Type.—W. E. Newton (com.), 3897. J. T. Lane, 3941. W. S. Gedge and C. Hayward, 3963. G. Newsam, 4027. C. Bolkoevener and E. Heidenhaus, 4146. W. L. Wise (com.), 4178.

Propelling Carriages.—A. C. F. Franklin, 3739.

Propelling Machinery, Transmitting Power and Motion, Converting Movements.—M. Muret, 3843. W. H. Baxter, 3914. W. North, 4041. C. D. Goubet, 4080. J. S. von Traunfels, 4186.

Pumps, Pumping and Raising Water and other Liquids Pumps, Pistons, and Packing.—J. G. Wilson (com.), 3747. A. M. Clark (com.), 3789. M. Benson (com.), 3907. E. G. Colton (com.), 4040. S. Pitt (com.), 4056. A. W. Smyth, 4127. A. Gunthorpe and B. Henoch, 4171.

Punching or Perforating.—A. M. Clark (com.), 3790. W. R. Lake (com.), 3904. J. W. Plunkett, 3939.

Rags and Waste.—J. H. Leather and J. Middleton, 3910.

Railways, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, points, Crossings, and Turntables.—H. Lockwood, 3861. J. A. Mays, 4109. J. S. Stony and F. G. Lynde, 4124.

Railways, Carriages, Coupling, Uncoupling and Altering Position of Carriages and Engines.—A. M. Clark (com.), 3771. P. O'Grady (com.), 3835. S. A. Say, 3990.

Reaping, Mowing, Making Hay, Gathering in Produce.—E. Edmonds (com.), 3742. B. Samuelson and W. G. Mainwaring, 3854. A. J. Tuckey, 3932. G. Kearsley and E. Whitworth, 4026. E. J. C. Bomford, 4129. J. W. Logan and W. Elder (com.), 4141. W. Woolnough and A. Kingsford, 4155.

Reflectors.—J. L. Pulvermacher, 4079.

Refrigerating, Cooling Liquids, Making Ice.—J. Harrison, 3935.

Registering, &c.—E. A. Caminada, 3744. H. T. Davis, 3773. W. Smith and R. Wall, 3814. A. A. Lebreton, 4061. J. Bailey, 4081. C. de Nottbeck, 4113.

Retorts and Crucibles.—S. A. Peto, 3992.

Roadmaking, &c.—J. Moysey. 3762. J. Neuburg (com.),, 3882. C. F. Lebille, 3920. W. B. Ensor, 4045. C. Bremerkamp, 4128.

Rockets.—S. J. Mackie, 3873.

Scents and Perfumes; Scent Bottles.—G., G. W., and J. Betjemann, 4012.

Sewing and Embroidering.—J. Moody, 3752. H. Bland, 3775. W. L. Bigelow (com.), 3880. E. T. Eughes (com.), 3934. J. W. Hill, 3943. A. Anderson, 4131.

Ship and Boatbuilding.—H. Kennard, 3737. J. Jackson, 3765. R. Dougan, 3886. J. W. D. M'Donald, 3903. W. R. Lake (com.), 4014. H. J. Goulstone, 4142. D. R. de S. Ferro, 4150.

Ships' Boats (Lowering, &c.)—J. M. B. Baker, 4071. E. G. Colton (com.), 4082. J. Nicholson, 4101. G. Ruxton, 4145.

Ships (Raising Sunken or Wrecked.—H. Park, 4073. J. A. Westermann, 4091. C. Kesseler (com.), 4104. A. W. Smyth, 4127.

Shot, Shell, Bullets, &c.—S J. Mackie, 3873.

Showcases.—J. H. Smith, 3756.

Sifting, Sorting, and Separating—P. Jensen (com.), 3763. H. Cutler, 3829. F. Thompson and W. H. Williamson, 4138. H. J. Haddan (com.), 4153.

Signals, Alarms, Communicating Apparatus, Conveying Sounds.—E. A. Caminada, 3744. F. E. Merry, 3788. E. B. Bright, 3801. C. Smith, 3816. S. J. Mackie, 3873. H. Moon, 4053. D. Fergusson, 4121. E. Ludlow, 4130. W. Stringer and H. Ivey, 4164. G. C. Pulford and H. Billing, 4173.

Skates, Skating Rinks.—W. P. Gregg, 3817.

Smoke (Preventing, Burning, and Condensing.—W. Mill and R. Scotland, 3881. F. W. Ashton, 4002.

Sowing Seeds and Distributing Manure.—R. Holmes, 3867.

Spindles; Spindles and Flyers, &c.—W. R. Lake (com.), 3902.

Spinning and Preparing for Spinning.—P. Kelly, 3735. J. Taylor, 3767. T. Clegg and E. 3800. W. Clark (com.), 3836. E. Hird, 3847. W. Henderson, 3871. L. Smith, H. Greenwood, and W. H. Knowles, 3885. W. R. Lake (com.), 3902. E. Crossley, S. Matthews, and J. Marsden, 3998. J. Clapham, 3926. J. W. Wilson, 3966. B. A. and W. Dobson and R. C. Tonge, 4054. B. A. and W. Dobson and J. Newhouse, 4055. P. L. Klein and G. Hundt, 4084. T. Brookes, 4088. E. Wilkinson, 4106.

Springs.—T. Bradford, 3826.

Stamps and Stamping, Seals, &c.—J. W. Plunkett, 3939. A. A. Usher, 3969.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—R. Hudson, 3782. L. Mills and W. Clark, 3865. A. M. Clark (com.), 3889. M. Benson, 3907. T. Moy. 3951. J. Donaldson, 4052. W. R. Lake (com.), 4137.

Steam Engines (Stationary, Locomotive, and Marine.)—D. Kennedy, 3776. E. M. B. Faull, 3786. C. M. Sombart (com.) 3780. J. Daglish and H. Lawrence, 3812. L. H. Hollands, 3940. C. N. May, 3987. S. Pitt (com.), 4056. A. Morton, 4144. W. E. Gedge (com.), 4165.

Steering or Guiding Ships, Carriages, Ploughs, &c.—E. A. Caminada, 3744. D. Kennedy, 3776. R. Bell, 3777.

Stone and Slate, Artificial Stone and Marble Grindstones and Millstones.—J. W. Throop (com.) 3840. W. H. Baxter, 3914. D. Gray, 4001. M. Coulson, 4050. N. Chippendale, 4156.

Straps.—J. Heap, 4115.

Sugar and Syrups, &c.—E. Beanes, 3884. C. D. Abel (com.), 4017.

Surgery, &c.—A. Ford, 3921.

Telegraphs; Telegraph Printing Apparatus.—E. A. Caminada, 3744. J. F. Bailey, 3804. J. H. Johnson (com.), 3892. C. F. Varey, 3916. W. E. Irish, 3923. S. F. von Choate, 3924. J. H. M'Clure, 3930. J. F. Bailey (com.), 5960. G. and E. Woods, 3971. J. H. M'Clure, 4011 E. Edmonds (com.), 4161.

Thrashing Machines.—C. Odling (com.), 3732.

Tobacco and Snuff, Cigars, Cigar-holders, Pipe and Cigar-lighters, Smoking-pipes, Tobacco-pouches.—E. A. Brydges (com.), 3893. C. G. Emery, 3977. C. G. Emery, 3978. B. Brones, 4108.

Torpedoes.—B. J. B. Mills (com.), 3856. C. A. M'Evoy, 3950. D. Fergusson, 4121.

Toys.—J. G. Tongue (com.), 3918.

Tramways and Tramway Carriages, Tramway Locomotives—A. M. Clark (com.), 3771. J. Hight, 3797. T. Floyd, 3811. C. Bremerkamp, 4128. J. H. Betteley, 4174.

Trimmings.—D. Whyte, 3805. L. Turner, 4072.

Umbrellas, Parasols, &c.—W. A. Barlow (com.) 3802. J. Willis, 3959. W. R. Lake (com.), 4136.

Upholstery, &c.—H. B. Barlow (com.), 3841. A. J. Goulstone, 4142. D. R. de S. Ferro, 4150.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—C. M. Sombart (com.), 3780. W. Shanks, 3864. S. H. Hollands, 3940. H. Lancaster and T. Dixon, 3974. H. E. S. Goodson, 3999. S. Pitt (com.), 4056. G. and G. Jennings, 4112. W. E. Gedge (com.), 4165.

Velocipedes, Bicycles.—W. H. J. Gront, 3749. H. A. Barrow, 3824. B. A. Jonle, 3827. H. Harrington, 3858. A. H. Lee, 3901. J. W. Hill, 3943. J. T. Trench and J. S. Simonds, 4147.

Ventilation; Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—W. and G. B. Symonds, 3794. H. and J. Bell and J. J. Coleman, 3862. W. Scott, 3879. W. Fisher, 4037. A. R. and J. W. Harding, 4070. T. H. Blair, 4157. E. Church, 4183.

Vices, Cramps, &c.—A. M. Clark (com.), 3772. P. Emanuel, 3867. G. C. Hopper (com.), 3994.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—T. Bradford, 3826. R. M. Collingham, 4013. E. G. Colton (com.), 4040. F. W. Ashton and W. Mather, 4176.

Waterclosets, &c.—G. A. Heron, 3898. G. and G. Jennings, 4112.

Waterwheels and Engines, &c.—S. Pitt (com.), 4056.

Waterproofing, &c.—H. Lockwood, 3861. E. P. H. Vaughan (com.), 3883.

Weaving, Braiding, Plaiting, Preparing for Weaving.—P. T. Macaulay, 3734. J. Owen and J. R. Aldred, 3761. T. G. F. Dolby, 3848. A. D. Stewart, 3806. J. Clapham, 3926. S. Westall, 3970. A. Flather, 4020. W. Dickinson, 4021. W. W. Cobbett (com.), 4038. E. Crossley (com.), 4143. A. Flather and A. Sowden, 4160.

Weighing Machines, Scales, Indicating Weight.—A. Mitchell, 4154.

Wheels for Carriages, &c.—W. H. J. Grout, 3749. H. A. Barrow, 3824. J. A. Mays, 4109.

Wheels for Machinery.—W. L. Wise (com.), 4076. W. W. Urquhart and J. Lindsay, 4122.

Window Blinds, &c.—F. W. Stillwell, 3965.

Windows and Sashes.—J. F. C. Farquhar, 3834. F. and F. A. Hamilton, 3851. J. F. C. Farquhar, 4048. P. Holland, 4158.

Wire-Working, Wire Ropes, Telegraph Cables.—A. M. Clark (com.), 3772. D. Bateman, 3911. G. and E. Woods, 3971. T. Ellis, 4035.

Woods and Veneers, &c.—H. B. Barlow (com.), 3842. H. Lowenberg, 4151.

Yeast.—N. D. Garrett and L. S. Lederer, 4024 A. H. Hassall and D. Hehuer, 4028.

⁎ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

M. Wurtz is to deliver the Faraday lecture during the present month.

Reviews.

BOURNE ON THE STEAM-ENGINE.

"Examples of Modern Steam, Air, and Gas Engines of the Most Recent Approved Types, as Employed for Pumping, for Driving Machinery, for Locomotion, and for Agriculture, Minutely and Practically Described. Accompanied by Working Drawings, and Embodying a Critical Account of all Projects of Recent Improvement in Furnaces, Boilers, and Engines. By John Bourne, C.E., Author of 'A Treatise on the Steam-Engine,' 'A Treatise on the Screw Propeller,' 'A Catechism of the Steam-Engine,' &c. In One Volume, Quarto, Illustrated by 53 Plates and 366 Woodcuts." London: Longman and Co., Paternoster-row.

Very like an old friend with a new face is this elaborate work of Mr. Bourne's, which is now completed by the issue of the twenty-sixth part—for it is so long ago as 1878, that it was begun, being published in monthly parts till 1870, when publication was suspended in the first place with the view of supplying some new information not at the time ready for publishing, and then ill-health caused further delay; so that the concluding parts, 20 to 26, have only been recently issued; a work which, for completeness and reliability, is of the highest order,—a worthy exemplar of the high attainments of its well known author. The delay that has taken place, Mr. Bourne remarks, will, he believes, not be without its compensations. A clearer insight has meanwhile been obtained touching the laws which must finally determine the forms of thermo-dynamic apparatus; and the course which impending improvement must follow has also become more conspicuous and indelible. He adds—My own experiments with coal-dust (the first cause of postponment of this work) show that the benefits formerly expected by myself and others from the use of the powdered fuel are illusory, for although I finally succeeded in burning powdered fuel without sparks, and without difficulty from clinker, yet the ultimate conclusion was, that the refuse coal as it comes from the mine could be burnt with equal or greater facility and with an equal or superior calorific effect. Bituminous coal reduced to a very impalpable powder by means of mill-stones is easily burnt. But such coal-dust is far too costly for common use. If the coal be more coarsely powdered by crushing it between rollers, I found it very difficult to burn it completely. If projected over or through a common fire the larger part of such dust passed off as incandescent sparks; and when an arrangement of furnace was perfected whereby these sparks were retained and subjected again and again to a blast of air until they were finally consumed the incombustible parts of the coal gradually formed a pasty mass of clinker by which the action of the furnace was obstructed. Under the arrangements finally employed, a liquid clinker was produced, which ran out of the furnace, and the mechanical difficulties which stood in the way of the perfect combustion of the dust were surmounted. But it was then found that the coal could have been utilised more simply and quite as efficiently if it had been burnt in the usual way without being reduced to the form of dust at all. My original expectation had been that, by reason of the minute sub-division of the fuel, its combustion would have been almost instantaneous, whereby the furnace might have been reduced to small dimensions. But unless the coal were of the bituminous kind, and were powdered very fine, this anticipation did not prove correct. As the dust, except when it first entered the furnace, was suspended in an atmosphere of carbonic acid or carbonic oxide gas, the solvent action was much slower than in the case of fuel on the bars of a grate which continually encounters a fresh current of air, whereas in the case of dust travelling with the current there is no relative motion between them. On the whole, the burning of the dust was found to be a difficult operation to accomplish and when accomplished, it was further found that the pulverisation could be dispensed with without detriment to the result.

With regard to the present position and future prospects of the steam-engine, Mr. Bourne thus expresses himself, notwithstanding the vast number of expedients which have been propounded for the transformation of heat into power, the steam-engine continues to be the only thermo-dynamic motor yet available for purposes of any importance. A few gas engines by Lenoir, Hugon, Otto and Langen, and others have been introduced for petty uses, their chief recommendation being that they do not require so much attention in working as an engine dependent on a boiler. But even in this respect there will be little difference between the two systems, if the boiler is heated by gas, and if a self-acting feed, to maintain a uniform level of the water, be employed. The size and cost of a gas engine without a boiler, are about as great as the size and cost of a steam-engine with a boiler, and the steam-engine is more equable in its action than a gas engine, and less noisy. The thermo-dynamic efficacy of the air or gas engines, hitherto introduced, is not high; and although in the engines of Hirsch, Fleeming Jenkin, and others, in which the cylinder is converted into a furnace burning gaseous or liquid fuel, and kept very hot, a high performance ought to be attainable, yet no engine upon that principle has yet been brought into successful operation, and the ends proposed by those engines are probably attainable by simpler means.

The most important modern improvements in expedients for the generation of power, are the high-speed engine and the compound engine. It has been found that, instead of the speed of engines being limited to the pace employed in the last century, they may be run much faster, provided that the momentum of the reciprocation parts is balanced, that the rubbing area of the bearings is increased, and that the other parts are suitably constructed for the higher speed. The advantages of the acceleration are, that the motion is more equable, and that the engine is both lighter and cheaper for the generation of a given power, while, from the enlargement of the rubbing surfaces, the wear is no greater than it was before. The compound engine, as now made, is much more economical in fuel than the simple engine of the old-fashioned type. But it is not so much from the use of the double-cylinder arrangement, as from the simultaneous employment of steam of a high pressure worked expansively, that the reputed economy of the compound system has been derived. Engines of similar size using steam of the same pressure, and working with the same measure of expansion, will consume the same quantity of fuel in generating any given power, whether the engines are on the simple or compound principles, and, it is therefore rather in the large use of expansion than in the adoption of the compound principle that the secret of modern economy consists. In the present work I have recapitulated the best proportions for compound engines, and of the boilers suitable for working them. In steam vessels using any considerable pressure of steam, the use of surface condensers, which will return the steam to the boiler as distilled water, is indispensable. Salt water, when heated to the temperature answering to a high pressure, deposits its sulphate of lime, and the use of salt water in any boiler in which such a pressure is maintained, is consequently not permissible, as a mischievous amount of incrustation would thus be produced.

It will be found that, in the present work I have recapitulated the leading features of all the principal furnaces, engines, or other expedients for the production of power from heat, and in some cases, as in the air engine of Stirling, and the caloric engine of Ericsson, I have described the structure in detail. I have also given examples of modern steam engines and boilers of every class; and in the appendix I have introduced a variety of useful information, which could not be conveniently embodied in the text. While, therefore, the engineer will here find examples of the most modern and approved forms of engine construction, he will also find such a recapitulation of ingenious but unfruitful projects as may aid the progress of invention, prevent future waste of effort, and, at all events, satisfy an intelligent curiosity. I do not think there is any project of the least importance for the production of motion which I have omitted to notice, and in most cases I have given my opinion as to the character of its pretensions.

The work includes chapters on motive power engines, past, present, and future; fuel and boilers, including liquid fuel; pumping engines, including fire engines and centrifugal pumps; blowing engines; mill engines; marine engines; locomotive engines; various projects for motive power; air and gas engines; gas and other furnaces, and gas and other motors; Ericsson's caloric engine; experiments with coal-dust and gas furnaces; metals used in the construction of engines; compound marine engines; experiments with steam jackets and superheated steam; best proportions of heating and cooling surface in compounds; simple marine engines; engines of Ericsson's original "Monitor," and of "Dictator;" miscellaneous modern steam engines; Bourne's high-pressure high-speed engines; Cornish, Lancashire, vertical, and other boilers; straw-burning boiler; Maudslay's compound marine engines; torpedo boats; modern locomotive and traction engines; steam road rollers; steam fire engines.

And in the appendix, the following subjects, amongst others, are considered:—

Mr. Charles Wye Williams and his boiler projects; steam without smoke; evaporative power of coal; boiler explosions; economy of fuel and prevention of smoke; American pumping engines; on discontinuous movements of fluids; Morton's ejector condenser; the temperature of flames and dissociation; Mazeline's jet condenser; experiments to determine duty of Giffard's injector; the Shinz blast furnace; coal-dust patents; heat consumed in internal work; thermal resistance of liquids; strength of materials; elasticity of vapours; the Heaton steel process; Joule on the surface-condensation of steam; on the evaporative power of different boilers; compound engines, abridgement of evidence of different engineers; simple and compound engines compared; Steel boilers, report upon, to Lloyd's committee.

The volume is amply and splendidly illustrated by plates and woodcuts, and printed clearly on good paper. In fact, author, engraver, printer, and publisher, each and everyone is worthy of praise.

DOMESTIC MEDICINE.

"Domestic Medicine and Hygiene; being a Short Account of the more Common Diseases, their Causes and Treatment, written in Plain Language." By William J. Russell, M.B. London: Everett.

Though we are far from attempting to dispute the folly of any man being his own doctor in cases where the services of a duly qualified practitioner can be obtained, yet we consider that a general acquaintance with preventive and remedial medicine is a very desirable kind of knowledge for everyone, for it is often the case that the doctor lives at a great distance off. Moreover, all who are not rich people cannot afford to resort to the medical man till they have first tried to doctor themselves; and it is very desirable that this should be done under a proper understanding of what ought to be done. The work appears to be worthy of confidence. It is, therefore, a good one for the use of all who need medical aid before the doctor is resorted to.

BALDWIN LATHAM'S SANITARY ENGINEERING.

"Sanitary Engineering: a Guide to the Construction of Works of Sewerage and House Drainage; with Tables for Facilitating the Calculations of the Engineer." By BALDWIN LATHAM, C.E., M. Inst. C.E., F.G.S., F.M.S., Past-President of the Society of Engineers, &c. Second Edition. London: E. and F. N. Spon, 46, Charing Cross; New York: 446, Broome-street. 1878.

THIS second edition of Mr. B. Latham's able and trustworthy work further perfectionates, and fully brings it up to the requirements resulting from the advancement of knowledge of sanitary matters which has taken place since the first edition was published. As regards sewerage, this new edition is specially designed to bring to the knowledge of the reader information of the most recent date; many recent inventions relative to the construction of sewers or drains, and which merit notice, being described.

The tables, which formed an important feature in the former edition, have been very considerably extended, and a number of additional tables have been supplied in the present one.

The plates and woodcuts have been materially increased. Altogether the book is now as complete an exposition of the subject as anyone could desire.

NORTH WALES.

"Practical Guide to North Wales." By HENRY IRVING JENKINSON, F.R.G.S., F.R.H.S., &c. With Maps. London: Edward Stanford, 55, Charing Cross, S.W. 1878.

WE have before seen various guides by the author of this work, and have been struck with their clearness of description, together with the thorough practical advice to the tourist. In the volume under notice we find the same qualities. The author has, as in the other guide-books, strictly adhered to his plan of personally visiting every place mentioned, making memoranda on the spot, and this by itself ensures correct guidance being given to the tourist, essentially practical in the truest sense of the word.

The book is divided into various sections as to how the various localities should be visited, opening, however, with an introduction and advice as to tours, list of mountains, lakes, local names, history, geology, botany, mines and minerals, and angling in North Wales.

We may offer one suggestion in reference to the Guide that may, we think, to one with but a very slight knowledge of Welsh be of great use, and that is, that in addition to the "place names" given in the introductory part of the work, a few common phrases might be introduced in Welsh and English. It is true that a tourist in Wales, whether north or south, is not at a loss in towns, but in strictly rural parts it is difficult to make oneself understood, and should he not be able to speak the Welsh phrase required, he could point to the phrase in the book; or, better still, have such phrases written from the work beforehand.

With this one suggestion we commend the Guide to would-be tourists to North Wales, who will, we have no doubt, find it as stated by the author—practical.

THEORY OF SOUND.

"The Theory of Sound." By JOHN WILLIAM STRUTT, BARON RAYLEIGH, M.A., F.R.S. Two vols. London: Macmillan and Co.

THIS work is worthy of a high place in scientific literature, for it combines extensive and accurate experimental knowledge with that of the mathematician. It treats of the composition of harmonic motions; generalised co-ordinates; Lagrange's equations; Fourier's theorem; the vibrations of strings, bars, membranes, and plates; aërial vibrations; velocity-potential; investigations of Rankine and Stokes; vibrations in tubes and cubical boxes; reflection at the boundary between a gas and a liquid, or between two gases; speaking trumpets; whispering galleries; aërial refraction of sound by difference of wind, as explained by Stokes, and by difference of temperature as explained by Reynolds; application to Tyndall's observations on fog signals; Doppler's principle; theory of resonators; viscosity of fluids, and dissipation of sound.

Although we find great difficulty in selecting a quotation capable of affording a concise view of the character of the work, yet we will present the following on the law of reciprocity as possessing not only great scientific interest, but novelty also:—

"A few examples may promote the comprehension of a law whose extreme generality is not unlikely to convey an impression of vagueness. If P and Q be two points of a horizontal bar, supported in any manner (*e.g.*, with one end clamped and the other free), a given harmonic transverse force applied at P will give at any moment the same vertical deflection at Q as would be found at P, had the force acted at Q. . . . If we suppose the period of the forces to be excessively long, the momentary position of the system tends to coincide with that in which it would be maintained at rest by the then acting forces, and the equilibrium theory becomes applicable. Our theorem then reduces to the statical one proved in § 72. . . As a second example, suppose that in a space occupied by air, and either wholly or partly confined by solid boundaries, there are two spheres, A and B, whose centres have one degree of freedom. Then a periodic force acting on A will produce the same motion in B as if the parts were interchanged; and this, whatever membranes, strings, forks on resonance cases, or other bodies capable of being set into vibration, may be present in their neighbourhood. Or, if A and B denote two points of a solid elastic body of any shape, a force parallel to OX, acting at A, will produce the same motion of the point B, parallel to OY, as an equal force parallel to OY, acting at B, would produce in the point A, parallel to OX. Or, again, let A and B be two points of a space occupied by air, between which are situated obstacles of any kind. Then a sound originating at A is perceived at B with the same intensity as that with which an equal sound originating at B would be perceived at A. The obstacle, for instance, might consist of a rigid wall pierced with one or more holes. This example corresponds to the optical law that if, by any combination of reflecting or refracting surfaces, one point can be seen from a second, the second can also be seen from the first. In acoustics, the sound shadows are usually only partial, in consequence of the not insignificant value of the wave-length in comparison with the dimensions of ordinary obstacles; and the reciprocal relation is of considerable interest. A further example may be taken from electricity. Let there be two circuits of insulated wire, A and B, and in their neighbourhood any combination of wire circuits, or solid conductors, in communication with condensers. A periodic electro-motive force in the circuit A will give rise to the same current in B as would be excited in A if the electro-motive force operated in B. Our last example will be taken from the theory of conduction and radiation of heat, Newton's law of cooling being assumed as a basis. The temperature at any point, A, of a conducting and radiating system due to a steady (or harmonic) source of heat at B is the same as the temperature at B due to an equal source at A. Moreover, if at any time the source at B be removed, the whole subsequent course of temperature at A will be the same as it would be at B if the parts of B and A were interchanged."

MESSRS. CASSELL'S PUBLICATIONS.

THE serials now issuing by those enterprising publishers Messrs. Cassell, Petter, and Galpin still progress in a very satisfactory manner. "Science for All," "The Practical Dictionary of Mechanics," "The Domestic Dictionary," "The Great Industries of Great Britain," being one and all of most praiseworthy character.

WHAT TO WEAR IN NOVEMBER.—Woollen materials of tartan patterns make up into cheerful-looking costumes, and in England they have obtained a footing this season, although by no means such a sure one as in France. I give an illustration of a house-dress of fancy tartan, to show the most becoming style of make. The cording should be silk, to match the colour that predominates in the plaid. Dark grave colours in fancy plaids belonging to no special clan are patronised in England; but the Parisian have shown great preference for the Scotch clan tartans, in which every line, bar, and colour, follows a design that has been in use for generations, and has never varied—the forty-second (a combination of blue and green), the Argyll, the gay Mackenzie tartan, with lines of red and yellow amid blue and green), the Forbes, the Malcolm, and the Macleod. The Parisians show great skill in making up these clan tartans, disposing the plaids in most effective ways. Sometimes a certain bright portion of each plaid is arranged to fall at the top of each kilt-plait; at other times a single square forms the yoke, the cuffs, and the pocket. A simple style of making a tartan costume is by intermixing plain cashmere. The tartan skirt is kilted, and a scarf-tunic of either navy-blue or bronze-green cashmere is tied across it. The bodice is plain cashmere, the waistcoat is plaid. The buttons for fastening these dresses are flat gilt ones, the colour of Etruscan gold, and engraved like pure gold. The belts, which are wide, are fastened with square gilt buckles.—From *Cassell's Family Magazine* for November.

THE "INTERFERENCE OF WAVES.—Instead of one, I throw at the same moment two stones on the surface of the still water. Two systems of waves are produced, and they very soon meet at a point in the straight line which joins the centres of disturbances. Where the two sets of wave-rings meet, one of two things may happen; either—(1) Crest may coincide with crest, and hollow with hollow, and give us crests and hollows of double height and depth at the place of meeting; or—(2) The crests of one system may coincide with the hollows of the other, and give us no wave at all at the place of meeting. How one wave may *interfere* with another, as in (1) and (2), is better seen after considering the part an individual water-particle takes in the wave motion. A cord placed on the surface of the water simply dances up and down when the wave passes; therefore, the water-particles which carry it simply dance up and down, and they do not travel along with the wave. The wave is consequently only a traveling *form*, and is produced by the communication of motion from one set of water-particles to another. When a wave meets another, and is in complete accordance with it, as in (1) the wave resulting is formed, as it were, by the superposition of one on the other; for the water-particles would have been carried to a certain height and depressed to a certain depth if only a single wave had passed the meeting-point at a given moment; and when another passes at the very same instant, a double force is exerted on the water-particles: they are carried to a double-height, and depressed nearly to a double depth. On the other hand, when one wave reaches the meeting-point half a wave-length before the other, or lags behind half a wave-length, crest is made to coincide with hollow, as in (2), and at the point of meeting a water-particle is constrained to go up, and it is equally constrained to fall down. Between the two there is little, if any, motion at all. Such phenomena go under the general name of *Interference*, and in whatever medium waves are produced, we may have such a mutual action of one set on another.—From *Science for All* for November.

How to Skate.—The price of a pair of skates varies greatly. Sometimes a good serviceable pair may be bought secondhand for three or four shilling; but the shop price for new skates ranges from seven shillings and sixpence to twice that amount, according to quality, &c. For skates of fancy or patent construction still higher prices are asked. Having obtained his skates, and well secured them on, the learner is ready for his first venture on the ice. He will probably look round for the kindly aid of some friend in his early efforts; but if he cannot find such assistance, he will have no great reason for regret. It is to his advantage that he should acquire the habit of independence of all external aid, as far as possible, from the first; and if he can find some one to lead him on the ice in the first instance, and, perhaps, to help him to rise after his first fall or two, it is all he should desire. The habit of trusting to something, or somebody, to help him to rise is soon formed, and will greatly retard his advancement. The best of all external aids, if any be adopted, is a chair on the back of which the beginner places his hands to steady himself. If there is no one at hand to help him in his first attempt, he should endeavour to stand firmly on the ice by pressing his heels downward, nearly together, with the toes turned outward, and bending the body forward; if he falls he must rise and renew his position. As soon as he is standing upright, he should strike forward with a sliding motion on either foot, not pressing equally on all parts of the flat undersurface of the skate, but rather upon its inner edge, called technically the "inside edge," while that on the other side is the "outside edge" in skating language. After progressing a yard or so on one foot, set down the other, and strike forward with in the same way; and so on alternately. Always remember to incline the body forward, and if you fall, *fall gently*. This may seem strange advice, but it is quite practical. A person who loses his presence of mind, and makes wild efforts to save himself, will probably receive a much severer hurt than one who, when he feels himself going, keeps his limbs together, and endeavours to fall as lightly as possible. Having become a little accustomed to forward progression, try to proceed in a line which describes a curve. In moving forward, incline the body from right to left as you change your feet, so as to preserve your balance. To stop yourself, you rise your toes slightly from the ice and press the heels firmly downward, being careful to throw the weight of the body forward meanwhile, or your feet will slip from under you.—From *Cassell's Popular Educator* for November.

M. Leymarie, Professor of Geology at Toulouse, who is reputed to have constructed the first geological map of France, is dead.

COLLISIONS AT SEA.—LOSS OF THE PRINCESS ALICE.

We extract the following from the "Life-boat; or, Journal of the National Life-boat Institution," for November. After the general consideration of disastrous collisions at sea, and some remarks on the question of who was to blame, in which the writer, as it seems to us, very properly—subject of course to the result of judicial inquiry—frees both the Bywell Castle and the Princess Alice, he proceeds to the second and most important division of the subject, the prevention of loss of life from the collision of vessels in the future, more especially in narrow and winding channels, such as that of the river Thames, which division he again subdivides under two heads—

First, such an addition to the established "rule of the road," in conjunction with suitable night signals, as would enable two vessels approaching other in the night to distinguish the direction in which each was steering and intending to steer.

Secondly, precautionary and remedial measures, and the provision of appliances for saving the crew and passengers of any vessel after a collision or other accident had occurred, such as boats, life-buoys, life-belts, and other floating articles.

On the first head, it appears that for a certain number of years the local "rule of the road" for the navigation of the Thames was in force which required that all vessels going up the river should keep on one side of it, and those outward bound on the other; that is to say, as far as it might be practicable to do so, for sailing vessels working to windward would of necessity have to cross from side to side.

The rules for avoiding collision on the river have, however, since 1862 been the same as those prescribed for preventing collisions at sea, but a committee appointed by the Board of Trade, Admiralty, and Trinity House, prior to this collision, have proposed that the old rule for navigating steamships in narrow channels should be returned to, viz., that each ship should keep to the starboard side of mid-channel. To port helm would then always be right on the approach of another ship, and would agree with the "rule of the road" at sea.

They also recommended additional words in the rules to signify that to port the helm means to alter the course to starboard, and *vice versa*, since foreigners would generally understand the above terms in the reverse sense to that intended.

On the rivers of the United States certain varied notes of the steam whistle indicate to neighbouring vessels the course about to be taken—an excellent system, which might with advantage be adopted by this and other countries. These signals are as follows:—

1. One short whistle—"I am starboarding my helm."
2. Two short whistles—"I am porting my helm."
3. One long, continuous whistle—"Engines are stopped."
4. One long, then one short whistle—"Going ahead slowly."
5. A series of short whistles—"Engines reversed."
6. One short, then one long whistle—"Going astern, or stopped."

An ingenious description of night signals has also lately been invented by Lieutenant E. W. Very, of the United States Navy, and adopted by that Government, which might be readily utilised to indicate the intended movement of any ship. It consists of a large-bored pistol, from which are discharged, to a considerable height or distance, brilliant fireballs of various colours, such as those thrown up by a firework called a "Roman candle." The cartridges and fireballs being in waterproof cases, and igniting by percussion, they could be used in wet and stormy weather with much greater facility and rapidity than rockets, besides being of much less expensive character, and one of these fireballs being discharged from a ship's bows to the right or left might be made to indicate that the course was being altered to starboard or port, whilst one thrown up perpendicularly might signify that the engines were stopped.

Some such forewarning, at all events, seems to be indispensable, and no doubt the practicability of the same will be fully considered by the public Board of Inquiry at present sitting.

Under the second head, precautionary and remedial measures, as might have been expected, many suggestions have followed this disaster, a prominent place amongst which, we think, should be given to overcrowding, which cannot but be a fruitful source of danger, and which, we trust, will be seriously considered by the Government Board of Inquiry.

Thus we find that the Princess Alice, a slight, narrow vessel, of only 251 tons gross tonnage, and with only 20 feet 2 inches beam, was registered to carry no less than 936 passengers, being, in our opinion, about twice as many as she ought to have been allowed to carry: Indeed, it has been stated that she was on a previous occasion nearly upset, in consequence of the passengers from some cause surging to one side of her deck.

Another precautionary measure which has been suggested is that all steamers entrusted with the lives of so many persons should be divided into separate sections by watertight bulkheads, which, even in so extreme a case as that of a vessel being cut in two, like the Princess Alice, would at least retard the sinking of her hull, and so afford time for the rescue of a large number, if not all, of those who were on board her.

Another suggestion made is that all river passenger steamers should, like the splendid ferry paddle steamers of the Mersey, which are continually crossing between Liverpool and its south shore, have their sponsons extended through their whole length, but tapering towards the bow and stern, thus adding immensely to their strength, and forming an invaluable buffer or fender in the event of their being run into, or, in modern phraseology rammed, on the broadside, which would have to be completely cut through or crushed before the vessel's side could be touched by the stem of the aggressive ship.

A third precautionary measure which has been proposed, consequent on this lamentable collision, is that the excursion steamers on the Thames should not be allowed to ply after dark. Regarding this suggestion, we will merely observe that of necessity many passenger steamers must be making their voyages during the night; at the same time, however, there can be no reason why these daily excursions on the Thames should not be required so to arrange their trips as to conclude them before nightfall.

Lastly, we come to the old and vexed question as to what contrivances are the best to effect the rescue of persons on board vessels after disaster has occurred. In considering that question, however, it will be as well to divest our minds of the idea that any contrivances, however, ingenious and suitable, would ever be sufficiently available in cases of disaster so sudden and complete as that of the Princess Alice, especially when occurring in the night, to do more than save a portion, and often perhaps but a small portion, of lives that would otherwise be lost. The confusion on such occasions is so great, and the helplessness of those to be saved so complete from fear and loss of presence of mind, especially as regards females, that they are incapable of availing themselves of the help placed in their hands.

At the head of such contrivances must be placed the ship's boats; and of course if the boats were sufficiently numerous, and could always be promptly and safely lowered, they would deservedly occupy the first place. Unfortunately, however, such is not the case, since, as a rule, they are insufficient in number, often out of order, or with plugs out and not to be found; if lowered in time, have one end lowered before the other, and are at once swamped, or are so over-filled with frightened people that they immediately upset.

The only suggestions that we can offer respecting them are that, when passengers are on board, they should be kept always clear for lowering, with their plugs always in, their oars and thowel pins or crutches always ready for instant use, that the lowering apparatus should be incapable of lowering or releasing one end before the other, and that they should be self-releasing from the davits on becoming immersed by the foundering of the ship.

Next to the ship's boats, an abundant supply of floating bodies, which could be individually appropriated by persons either in the water or before immersion, is of paramount importance. Life-buoys and efficient life-belts are very good as far as they will go, but they cannot be supplied in sufficient numbers in crowded passenger vessels on excursion trips.

There is no reason, however, why the seats and benches on deck, and the cushions of the seats and chairs in the saloons, might not all be made of such buoyant material that each would readily float one or more persons in the water. The seat cushions in saloons and cabins might be formed of a number of small, separate parts, each of which, having a buckle and strap attached to it, could be carried on deck by a passenger on the first signal of alarm, and, secured round the body, would be at once an efficient life-belt. Samples of such life-belt cushions can be seen at Messrs. J. and A. W. Birt's, the life-belt and life-buoy manufacturers to the Life-boat Institution, the Admiralty, and Board of Trade, as also an ingenius adaptation of the common camp stool provided on board passenger steamers, by which each is converted into a life-buoy.

IMPROVED STEAM FIRE ENGINE.

HITHERTO the consumption of a considerable quantity of gas has been found necessary in order to keep up the temperature of the water in the boiler. This is now avoided by an improvement introduced by Messrs. Shand, Mason, and Co., into their inclined water tube boiler, consisting mainly of an increase of the heating surface, the quantity of the water remaining the same. By this the time required for raising steam is reduced by between two or three minutes. The engine is of the makers' well known single cylinder type with bucket and plunger pump. The vertical and rotary parts are evenly balanced, so that the transverse oscillation previously noticeable has been entirely overcome, and the engine works at high speed with great regularity. The valve passages in the pump have also been enlarged, and the steam used more expansively, so that weight for weight the engine is rendered about one-third more powerful than those previously in use. By these means, and without increasing the weight of the boiler, the area of the steam cylinder has been largely added to, so as to enable a jet of water to be thrown to the increased height required by the great extension of lofty buildings in London. A novel form of self-acting by-pass has been adopted, which can be adjusted so that the whole or any part of the water pumped is returned to the suction chamber, enabling the fireman directing the jet to control it completely without sending messages to the engine-driver. An engine of this kind formed part of Messrs. Shand, Mason, and Co.'s exhibits in the Paris Exhibition.

FOREIGN SCIENCE.

THE Société Hollandaise des Sciénces of Harlem has awarded the Huyghens medal for 1878 to Mr. Simon Newcomb, astronomer of the Washington Observatory, in consideration of the excellence of his works on the movements of the planets and satellites of the solar system, the determination of the distance between the earth and the sun, the transit of Venus, &c. The society propose as the subject for the medal for next year the question of the connections existing between the appearance of sun-spots and various magnetic and meteorological phenomena.

A novel improvement in the microscope has been made by M. J. von Leuhosseck, a native of Germany. It consists of an apparatus which permits of the observer examining or operating successively with as many as sixty different microscopic objects, without the trouble of withdrawing or retiring in order to readjust the objects, as is now necessary. The construction is somewhat similar in principle to that of the spectroscope; and the instrument is styled by the inventor the "polymicroscope."

At the meeting of the Academie des Sciences of Paris, on the 14th October, M. Fizeau, the president, announced the death of M. Gabriel Delafosse, an old and well-known member of the society, and who had attained to considerable eminence as a professor of mineralogy and crystallography.

Some interesting particulars with regard to electric lighting are contained in an article by M. Paul Jablochkoff, published in a recent number of *La Correspondance Scientifique*.

It appears from the official report (which has just been issued) of the late deplorable accident in the St. Gothard Tunnel, that the explosion was caused by the carelessness of one or more of the workmen in displacing some of the dynamite contained in one of the waggons used in the tunnel.

A series of conferences have been organised by the Geographical Society of Paris, with the object of bringing forward and discussing any important matters which may be attracting the attention of the public with regard to geographical science, and more particularly subjects of commercial interest. The first of the series was held in the Boulevard des Capucines on October 4th, under the presidency of M. de Lesseps. The second took place a week later, when M. Allan, the Algerian explorer, presided. We shall again allude to the proceedings at these conferences.

The distribution of the medals and awards to the exhibitors at the Exposition Universelle at Paris took place on October 21st, in the presence of nearly 25,000 spectators.

Among the new books recently issued by Paris firms, a work on "The Climate of Rome," by M. Ferrari, Director of the Roman Observatory College, which has just been published; and M. van der Mensbrugghe's "Studies on the Potential Energy of Liquid Surfaces" are worthy of attention.

COLOUR PRINTING BY PHOTOGRAPHY.—The production of coloured photographic prints by the Albert process has attracted a good deal of attention lately, and the *Engineer* thus explains the method by which they are obtained:—Three negatives are made after the coloured original, one in which the blue had no effect upon the plate, but all the other colours. This negative is used for the production of the Lichtdruck plate for blue colour. In the second negative all colours take effect except yellow; in the third all colours except red. The second negative, therefore, forms the Lichtdruck plate for the yellow; the third that for the red colour. All three plates are printed upon the same paper, and furnish the complete picture.

LARGE DRIVING BELTS.

AT the Paris Exhibition some fine main driving belts, made after Sampson's patent, are shown by Mr. Edwards, of Manchester. There is one double belt, 207 feet long, 63 inches wide, which weighs 2692 lbs., and is made to transmit 600 indicated horse power. Another is 184 feet long, 53 inches wide; while a third is 163 feet long and 63 inches wide. These two latter weigh together 4378 lbs., are without cross joints from end to end, and are intended for a large cotton mill, to drive direct a flywheel 30 feet in diameter, and 10 feet 3 inches on the face. The combined horse power they are made to transmit is 1000.

A CHEAP ILLUMINATED CLOCK.

REINIGER, of Stuttgart, proposes an ingenious substitute for illuminated tower clocks. It is the use of a magic lantern, so frequently employed for street advertising in America. A small lantern could be so arranged as to throw the picture of a common watch or chronometer upon a suitable white screen in places much frequented at night. The movements of the hands would be quite as distinct as those of a real clock with transparent face and a strong light behind it. The project recommends itself to small cities, unable to bear the expense of a costly tower clock with illuminated face.

GAS LIGHT.

AT the recent meeting of the British Association the report on the best means of developing light from coal gas, by Dr. Wallace, of Glasgow, was read by Dr. Wills, F.R.S. He approved the use of cannel rather than common gas on account of its comparatively small influence on the atmosphere of apartments, and the smaller proportion of sulphur it contains. He also recommended that gas be formed at low pressure, and that district governors be used to ascertain the pressure at different levels in towns. He mentioned the fact that the average illuminating power of gas delivered by the Scotch companies was twenty-six candles, whereas in London it is only sixteen, and in the chief cities and towns of England and Ireland only fourteen. The use of globes round light reduced the quantity 10 per cent.

MARKING INK WITHOUT NITRATE OF SILVER.

ONE drachm of aniline black is rubbed up with 60 drops of strong hydrochloric acid and 1½ oz. of alcohol. The resulting liquid is then to be diluted with a hot solution of 1½ drachms of gum arabic in 6 ozs. of water. This ink does not corrode steel pens; is affected neither by concentrated mineral acids nor by strong lye. If the aniline black solution is diluted with a solution of 1½ oz. of shellac in 6 oz. of alcohol, instead of with gum water, an ink is obtained which, when applied to wood, brass, or leather is remarkable for its extraordinary black colour.

PENITENCE.

By the old orchard door,
  When the wooing air is wandering,
And it whispers o'er and o'er
The sweet name I yet adore—
  Darling, there I linger pondering!
  While the wooing air is wandering—
All our love which reached no shore.

Tho' the young passion dreamed
  Long years since, re-bloom in splendour:
Like an eastern fire-flower beamed,
Till life all love-glamour seemed,
  Yet my heart wept its surrender
  For I saw, thro' all their splendour,
Those eyes with tears repentant gleamed.

V. GONVILLE.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
(Journal of the Inventors' Institute)
Is published at the
OFFICES, 21, COCKSPUR STREET, CHARING CROSS,
LONDON, S.W.,

In the 1st week of every Month, sent post free on prepayment of the ANNUAL SUBSCRIPTION OF 6s. 6d.; or it may be had by order, from Messrs. KENT AND CO., Paternoster Row, or any Bookseller or Newsagent in the kingdom, *price* 6d. *per copy.*

The SCIENTIFIC REVIEW, being well read by Manufacturers and Capitalists interested in inventions and enterprises for the promotion of industry, will be found a desirable medium to many Advertisers.

To Correspondents: SCIENTIFIC COMMUNICATIONS AND BOOKS FOR REVIEW to be addressed to the Editor at this office; as also letters respecting ADVERTISEMENTS, SUBSCRIPTIONS, &c.—Correspondents are desired to keep copies of their communications, as the Editor cannot undertake to return them.

Editor's Office: 21, *Cockspur Street, Charing Cross, S.W.*

THE INVENTOR'S INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, LONDON.

ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1878—1879

Members' Meeting—Thursday, November 28th, at 8.15 p.m.
Executive Council, at 7.30 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

DURING the past month nothing has transpired at the Executive Council calling for publication, and no Members' meetings have been held, the Institute being "Out of Session."

APPEAL TO MEMBERS.

Members whose subscriptions are in arrear will do great service to the cause by at once forwarding their subscriptions to Mr. G. A. Stretton, the Receiver, at 4, St. Martin's Place, Trafalgar Square.

INVENTORS' DINNER.

It is intended to have a public dinner during the present month (November).

POSTPONEMENTS.

We are compelled to postpone an interesting illustrated article on Mr. G. E. Pritchett's Improvements in Telephones.

Monthly Notices.

The lectures for the higher education of women, recently established under the auspices of King's College, has now assumed a permanent character. The classes are to be conducted in the same neighbourhood where they were commenced, at 5, Observatory Avenue Kensington. During the first two terms, when the system was regarded as tentative, the entries numbered from 500 to 600. A regular examination was held at Midsummer with satisfactory results; a class-list was issued, and certificates granted. The committee have now ventured on a larger scheme, in which all the chief elements of a liberal education are represented—Scripture, church history, logic and moral philosophy, ancient and modern languages, and history, mathematics, astronomy, chemistry, physics, physiology, and hygiene; botany, harmony, and drawing. If this scheme be well worked out, it will promote a useful object; and it is hoped that it may lead to the establishment of a regular college for ladies in Kensington. The present session was opened on the 14th inst., when Canon Barry delivered an inaugural address at the Vestry Hall, Kensington.

Mechanical science is being introduced at Cambridge. A workshop has been erected, and stocked with tools and machines, so that instruction can now be given in the use of tools in metal and wood, and also various instruments can be manufactured. Elementary practical classes will be started this term.

The Royal Society have again announced to all whom it may concern that applications for grants from the Government fund of £4000 for the promotion of scientific research, or from the Government grant of £1000, must be forwarded to the secretaries of the society before the last day of the present year. The meetings of the committees to consider the applications will be held in February next. It is to be hoped that the committee may at length see the advisability of making public a list of the applications received.

Messrs. Hardwicke and Bogue's announcements for the season include "A Manual of the Infusoria," by W. Saville Kent, F.L.S., &c.; "The Herefordshire Pomona," containing coloured figures and descriptions of the most esteemed kinds of apples and pears, edited by Dr. R. Hogg; "The Sphagnaceæ, or Peat Mosses of Europe and North America," by Dr. Braithwaite, F.L.S., &c.; and "The Ferns of North America," by Prof. D. C. Eaton, of Yale College, with coloured illustrations by J. H. Emerton.

Sudden Death of Dr. Harkness.—We regret to have to announce the death of the above-named gentleman. For many years he was Professor of Geology and Mineralology, and for the last year of Natural History also, in Queen's College, Cork. He was actively engaged in the examinations of the Queen's University, which are held in Dublin at this season of the year, and was to outward appearance in vigorous health; but he was a victim to heart disease, and while entering his bedroom, in the evening, he fell senseless on the floor. On medical aid being obtained, life was found to be extinct.

The first part of Philosophical Transactions for the present year, just published, contains Dr. Haughton's final discussion on the tides of the Arctic Seas, and a paper, by Sir George Airy, "On the Tides at Malta." Dr. Hopkinson contributes "Electrostatic Capacity of Glass;" Mr. C. S. Tomes, "The Structure of Vascular Dentine;" Prof. Schorlemmer the second part of his researches "On the Normal Paraffins;" and Mr. Crookes the fifth instalment "On Repulsion resulting from Radiation." "Experimental Researches on the Electric Discharge with the Chloride of Silver Battery" is the subject of two papers by Mr. Warren De La Rue and Dr. Müller, illustrated by exquisitely engraved plates of spectra, and a report by Mr. Lockyer and Dr. Schuster on the eclipse of the sun as observed at Siam in 1875 completes the part.

The sensations of light and colour, according to M. Aug. Charpentier and Dr. Landolt, are the result of two entirely distinct functions, and the explanation of this is said to be found in the chemical substance discovered by Boll and Rühne, which is discoloured by light, and is renewed in darkness.

Bray's Self-detaching Carriage Pole, as applied to fire-engines by Merryweather, obtained a prize at the Paris International Exhibition. Our readers will probably remember our description in a recent issue.

The decease of Dr. Robert Willis, author of "Life of Servetus" and other well-known works, is announced.

Sir ci. *Griffith*, the geologist, has to be numbered amongst those scientific men that death has removed from our midst.

The Scientific Review.

NOVEMBER, 1878.

LIGHTING IN THE FUTURE.

"SWEETNESS and light" are the great desiderata of the present day, whether we consider these terms as having reference to our moral or to our material existence. As regards sweetness of life, materially considered, doubtless much is being done by our sanitary reformers; but as regards light, little has been done; and little was attempted to be effected until the recent movement in favour of the adoption of electric lighting was set on foot; albeit this system of lighting is just now looked forward to as the one which is to enable us to obtain a really good light artificially; and the hope that we shall soon obtain the full benefit of the electric light, and riddance of those dreadful nuisances, the gas companies, gets so strong that it is said to have produced a panic amongst gas shareholders, who seem to have no faith in the vitality of the gas light system when opposed to the electric light, and refuse to be comforted by considering that even now the latter has scarcely got beyond the experimental stage of existence, and is therefore almost certain to be unavailing for general practical use for a long time to come. Furthermore that, independently of the use that may be made of gas for heating purposes, the survival of the oil lamp, and even of the tallow candle (both of which are found to be advantageous in certain cases), shows that there is room for successful co-existence for many different forms of light suppliers.

Our own view of the question as regards the immediate future is, that for lighting public buildings and streets, and such like places, the electric light will soon displace the gas lamps, but that for private use it will be a long time before it supersedes gas and the other lighting media now in use. In stating this much we are, however, not unmindful of the fact that up to the present time we have not been certified of the removal of the main difficulty to be overcome in order to render electric lighting for general purposes a practical success, namely, what is termed the division of the current, that is, its distribution from one machine, or pair of machines, over a number of lights placed at considerable distances apart; for although Professor Edison's plan is much talked of as being the solution of the problem, yet, in point of fact, as the *Times* very pertinently remarked in a masterly article on this subject recently published, the invention of Mr. Edison is not before us, and our public corporations and other persons see no sufficient reason for waiting for it, but are pressing forward as fast as possible to give the public the benefit of those improvements which are known to them, and which most persons, not excluding the gas companies, are fairly ready to appreciate and adopt. Apart from Mr. Edison's invention, there is a wide field of operations lying before the promoters of electric lighting, and it can hardly be doubted that those who boldly and successfully occupy this field will draw Mr. Edison's and all other real improvements after them. However, we do happen to know that plans are proposed by parties quite competent to deal with the question, which have in view the successful accomplishment of this important desideratum, but which cannot yet be brought before the public because of the non-completion of the patents.

Whilst the important point alluded to is waiting solution we have as *terra firma* the Jablochkoff invention, brought out some considerable time ago; Mr. Hollingshead's effective and useful display at the Gaiety Theatre, with a pair of machines working three circuits with two powerful Lontin lights in each circuit; also, the fact that the *Times* has been printed by the Rapieff light, by which more than twenty lights can be worked by one machine; and the journal alluded to having published statements in favour of this invention. It may also be said that the decision of the Metropolitan Board of Works that the Thames Embankment is to be lighted by the electric light may likewise be esteemed a practical testimonial to the efficiency of the invention.

That there are many points in regard to the electric light which require to be attended to is matter of no doubt. For instance, provision should be made for the independence of the various lights; that is to say, it must not be a matter of necessity that all the lights in one set of circuits be lighted and extinguished together. Further, the light should last for many hours without attention. Provision is also required to be made for re-ignition, if from any mischance a light should be extinguished. This has been met by the alternate current system of working, whereby the course of the current is reversed with frequency for the purpose of consuming two carbons equally, which is the plan adopted in the Jablockhoff electric candle Unfortunately, the machines with alternating currents have recently been brought under litigation, the patent for M. Gramme's new machine having been opposed at the Great Seal, and greatly delayed, and the use of the Jablochkoff light at Messrs. Wells' factory at Shoreditch being hindered thereby.

After all points have been considered, it is established that electric lighting is practicable. It only remains for inventors to perfectionate its practicability, and that it shall be brought sufficiently within the range of economy and general adaptability.

Proceedings of Societies.

ENTOMOLOGICAL SOCIETY.

SEPT. 4TH.—F. Smith, Esq., V.P., in the chair.—Mr. D. Price was elected a Member, and Capt. T. Broun a Subscriber. Mr. Rutherford exhibited two specimens of an orthopterous insect, *Palophus Centaurus*, West, from Old Calabar. Mr. F. Smith exhibited a specimen of the fruit of the so-called locust tree (*Hymenea conbaril*), from British Guiana, forwarded to Dr. Sharp from Mr. Harper. The fruit, on being opened, had been found to contain three specimens of a weevil (*Cryptorhynchus stigma*, Linn.), a cocoon containing the chrysalis of a moth, together with the remains of one or more such cocoons, and lastly a small parasitic hymenopteron (an ichneumon allied to Chelonus). Mr. Smith also exhibited a specimen of *Melontha vulgaris*, which had lately been found alive under earth at the bottom of a box in which the larva had been placed last April, thus making it appear probable that the insect assumes its perfect state undergound a long time before making its actual appearance. Mr. Champion exhibited a series of *Spercheus emarginatus*, taken at West Ham, Essex. Mr. J. Spiller exhibited some so-called "jumping seeds," received from Mexico, and contributed remarks thereon. The Secretary exhibited a photograph of a fossil butterfly, *Prodryas Persephone*, Scudd., received from Mr. Scudder. The insect represented was in an excellent state of preservation, and had been found in the tertiary formation of Colorado. Mr. Smith stated that, having recently had occasion to refer to the Linnean Collection in the apartments of the Linnean Society, he regretted to find it had been allowed to fall into a state of complete neglect. Mr. Swinton communicated a paper "On the Vocal and Instrumental Music of Insects." Mr. Waterhouse read a paper entitled "Notice on a small Collection of Coleoptera from Jamaica, with descriptions of New Species from the West Indies."

NUMISMATIC SOCIETY.

OCT. 13TH.—J. Evans, Esq.. D.C.L., LL.D., in the chair.—Mr. Evans exhibited a fine second brass of Agrippa stuck on a large brass *flan*. Mr. Grueber exhibited an electrotype of an Oxford ten-shilling piece of Charles the First in the Liverpool Museum; and Mr. Webb a half-crown of Charles the First of rude work. Mr. C. F. Keary read the concluding paper of a series upon the coinage of Western Europe from the time of Honorius to that of Charlemagne. This paper dealt with the causes of the numismatic revolution which followed the rise of the Carlovingian dynasty, viz., the substitution of a silver currency for the previous coinage in gold. After reviewing the notices of silver money to be found in the law codes of the various Teutonic nations, the writer argued that in the case of all those German peoples which lay around the borders of the Roman Empire there was evidence that the tradition of a silver currency had been preserved. This argument was especially pressed in the case of the earliest Saxon currency (the sceattas), with the object of showing the continued existence of a Saxon colony in England on the *litus Saxonicum per Brittaniam* from the days of Carausius downwards. The discussion upon the views put forward in the latter portion of Mr. Keary's paper was deferred until the next meeting. Mr. Hoblyn read some notes on coins of William and Mary. Mr. Grueber read a paper on a follis of Constantine the Great struck in London.

Sedgwick M. Wade, of Andover, Ohio, has patented a strap hinge, composed of two leaves, having flanges and rear tongs, the latter curved to form sockets for the pivot.

THE BRITISH ASSOCIATION.

AT the remaining sittings of the Association, subsequent to those reported in the SCIENTIFIC REVIEW for October, 1878, the transactions were as follows:—

AUGUST 21ST.

SECTION C.—GEOLOGY.

Mr. C. E. De Rance, F.G.S., read a paper "On the Geological Results of the late British Arctic Expedition."

Professor Haughton proposed a cordial and hearty vote of thanks to their distinguished president, Professor Evans, for the manner in which he had presided over the section during its recent sittings. The well-known and much loved Provost of Trinity College did him the honour a few days ago of consulting him as to those members of the Association upon whom the hon. degrees should be conferred. The Provost had made out a list, and he, Professor Haughton, also made out a list, and on both the name of Professor Evans was placed. This showed the opinion Trinity College had of Professor Evans. (Applause.)

Mr. Pengelly seconded the motion, which was passed with acclamation.

The President returned thanks, and expressed the debt of obligation he owed to the secretaries and the committee for the assistance they had given him. He hoped that the members of the section would go away with that degree of pleasure at their proceedings in Dublin which he felt himself. (Applause.)

SECTION D.—BIOLOGY.

The Rev. Mr. Griffin read a paper contributed by Mr. S. Dumont Beaghton—"A Note on an Expiring Race on the Bhutan Frontier of Hindustan."

Captain R. F. Burton, who was warmly applauded, made "The Flint Implements of Egypt and Midian" the subject of another paper. Most people, he said, were aware of the dispute between naturalists and Egyptologists. The latter declared that there was no such thing as infancy of art in Egypt, and the naturalists, as was their evil habit, found signs of the commencement and origin of things everywhere. (Laughter.) It was a very pretty quarrel as it stood. While literary men were debating, practical men found stones in every direction, even around Cairo itself. He exhibited flints, most of which were chipped, and which were found in great numbers, but Bedouins are now making them in enormous quantities and selling them to travellers. He first visited El Hawaii in March, 1877, and then proceeded to the Pyramid, the most southern part of the great cemetery of Memphis, and in the King's Chamber were found two prehistoric weapons. Captain Burton exhibited a number of worked stones, cowries from Thebes, ornamented glass, and the coins of Midian, which were for the first time brought to England. Near the chief town of Midian they came across a coin which showed that even in those days there were "smashers"—(laughter)—and was an imitation tetradrachma. It had the owl and the flower on it, but instead of being made of silver it was of copper, with a slight layer of silver outside. In conclusion, Captain Burton thanked the audience for their courtesy in hearing him, and he begged to join in congratulating their worthy chairman upon the honours which he had so worthily obtained. (Applause.)

The Chairman said that there could be no doubt the objects exhibited by Captain Burton were exactly of the same nature as those which had awakened so much discussion of late years, and were now universally recognised as being of human manufacture. The peculiar physical conditions of Egypt made it impossible to say whether these weapons belonged to remote antiquity or to the early period of Egyptian civilization.

Dr. Sigerson said he had tried by heating and then cooling flints to get flakes, but had not succeeded.

M. Renard read a paper in French "On Polyandry and its place in the evolution of the human family."

The Chairman noticed that M. Renard had quoted from Lamarque rather than from other eminent men, although Lamarque laboured under the disadvantage of having been crushed by the superstitious views of his day.

M. Renard said he hoped now that in France, as in England, superstition would not be able to crush science or men of science, and that science will have its way for the sake of the happiness of mankind. (Applause.)

SECTION E.—GEOGRAPHY.

Major Wilson, director of the Ordnance Survey of Ireland, read a paper on Cyprus, which was listened to with close attention.

SECTION F.—ECONOMIC SCIENCE.

Professor Ingram occupied the chair.

Mr. J. H. Campbell read a paper "On the Social Aspects of Trades Unionism."

SECTION G.—MECHANICAL SCIENCE.

Mr. Easton presided.

Mr. J. W. Shoolbred brought up the report of the Committee on Tidal Observations in the English Channel. The French Association for the Advancement of Science had obtained the co-operation of the French Government in having elaborate observations made along the French coast. These observations, with others made on the Dutch, Belgian, and English coasts were most valuable, but as they were not yet in a condition to be submitted to the Association the Committee asked to be re-appointed.

Mr. Shoolbred also read a paper "On the Present State of Electric Lighting." The paper stated that electric lighting had attained its present development by certain marked stages of progress. The first stage was identified by the now obsolete and cumbrous magneto-electric machines of the Holmes and Alliance type, and which were applied only to a few lighthouses. The next stage was represented, in this country at least, by the dynamo-electric machines of Gramme and Siemens, a single light being produced from each of these small and handy machines. The latest and present development is that of the divisibility of the electric light, which has been satisfactorily solved for the last twelve months in Paris by the Lontin system and by the special Gramme machine, supplying the well-known Jablochkoff candles and providing in some cases ten, fifteen, and even more lights from one single electric source. The Lontin system has during the last year illuminated several of the railway stations at Paris, and it is also to be seen at work at the Gaiety Theatre in London. Some of the various forms of lamps or regulators most suitable were touched upon and their delicate and ingenious character described. The importance of extreme regularity in the motive power, whether a hydraulic, a gas, or a steam engine was used, was strongly urged. Some details also were given of the cost of production of the electric light in certain manufactories in France, a fair idea being that the cost was represented by that of a little more than one-horse power per light, giving 1000 standard candles per hour, the expense of which might of course vary with with the locality and with other circumstances.

In the discussion which followed, Mr. Douglas, C.E., of the Trinity Board, said, they had the old machines in two lighthouses, and in one, the Lizard, they had the late machine of Siemens. The old carbons from the graphite of gas retorts were very inferior to what they were using at present manufactured by Siemens

Mr. Witham had very great confidence in the Gramme electric machine, which he had been using extensively. He had had one knocking about for a great many months and receiving rough usage from workmen without any impairment to its efficiency. With regard to the cost of the electric light, he had some doubt whether it was cheaper than that of oil or gas. It was difficult to compare gas light and electric light. There was an element of intensity in one and great quantity in the other. It was a question how far the diminutive light from the carbon points of an electric machine was available for doing the work of lighthouses, and whether in a fog the electric light or gas light would be more useful to mariners. He thought that the property of gas companies would not be seriously affected by what had been done with electric lighting, and that the time was still far off when electric light could be used for the ordinary purposes of private houses.

Mr. Briggs said he had been one of the members of a committee appointed by the Franklin Institute in America to consider the question of how far they could make the electric light effective for ordinary lighting purposes. They were engaged for a long time in making investigations, and were able accurately to compare the cost of gas light and electric light, and to fix the quantity of light given and the quantity of heat expended. As a result, they were able to state that the cost of electric lighting was about half that of gas lighting. He thought they had to look forward with the greatest gratification to the development of light by means of electricity as infinitely superior to the light derived from the burning of any gas whatever. The enormous amount of heat wasted in the burning of gas was also a matter of importance, being thirty-four times as great as the amount of heat accompanying electric lighting.

A member said he was informed that when the gas managers were lately in Paris, they went into a very serious investigation of the comparative costs of the lights, and found that the cost of electric lighting was some thousandfold more than that of gas. (Applause.)

Mr. Denny Lane said he had recently spoken to Dr. Siemens as to the possibility of the electric light being so far subdivided as to militate against the ordinary use of gas, and his reply was that they had different circles to fulfil, and that very rarely one of those circles would overlap the other. That opinion agreed with his own previous opinion. It was impossible to produce economically single electric lights less than about 1000 candles, but there were many cases in which it would be much better to have 100 lights of ten candles each.

Mr. James Lynam, C.E., read a paper on the River Shannon.

Mr. Neville supported the conclusions of Mr. Lynam's paper.

Mr. Price stated that being in charge of the Midland Railway of Ireland, which crossed the Shannon twice and its tributaries numberless times, he had been obliged to consider the question of the Shannon, and it was his opinion that the present condition of things must be changed; that the fixed weirs must give place to movable weirs, as in France, or to weirs with sluices. He was in favour of sluices. The present condition of the Shannon was wrong, and the erection of very large sluices would prevent any flooding.

Mr. Bruce Bell, of Glasgow, also supported the proposition that the present fixed weirs should be done away with, and said that in executing some works for the town of Pelotas, in Brazil, he and his partner had adopted sluices designed by Mr. Frank Storey, in which the pressure came against the back of the sluice instead of its face, and these were found to be perfectly successful.

Mr. Lynam briefly replied.

The President (Mr. Edward Easton, C.E.) proceeded to sum up the discussion on the paper read by Mr. Lynam relating to the river Shannon. Probably it would be conceded that if the river throughout could be lowered permanently 2ft. a very great amelioration would be effected. As far as he could make out from the evidence, the river might be lowered 2ft. without interfering with the interests of navigation in the slightest degree. But lowering the general level would be of very little service unless there were means of regulating and lowering the level of the lakes in times of flood waters, so as to receive the flood waters when they came down. There would have to be a system of movable weirs or sluices to accomplish this object. The sluice mentioned by Mr. Bell, and for which he rightly gave credit to Mr. Stoney, nephew of his respected friend, Mr. Bindon Stoney, was one which seemed very likely to be applicable in this instance, because it enabled one to make that opening of very great width. There were two or three obstructions, which would have to be removed by dredging or blasting. The President concluded by thanking Mr. Lynam for the very valuable paper he had brought forward. (Applause.)

Mr. James Price read a paper "On the Use of Wind Power for Raising Water, disposal of sewage, and drainage, with special reference to Ireland."

The Hon. R. C. Parsons read a paper "On a System of Ventilation by means of fans and punkahs, worked by compressed air," a model of which (in action) he produced, and which he explained would be of great use in India and other hot climates.

Mr. Parker Neville gave an account of the Dublin Waterworks, pointing out the peculiarities of their construction by means of diagrams.

Three papers, including one by Mr. Thomas A. Dillon on a ship-raising machine, could not be read owing to want of time.

ANIMAL INTELLIGENCE.

Although the most important business of the British Association is connected with the meetings of the sections, its means of imparting knowledge and stimulating a spirit of inquiry have not been limited to its collective action. Individual members who have made special subjects their study have found other opportunities for communicating the results of their researches. Lectures have been given in the evening with a view of exciting a popular interest in certain scientific questions, and have proved eminently successful—at least, in bringing large numbers together. The first of these was delivered in the Exhibition Palace, before a large and distinguished audience, by Mr. George J. Romanes, M.A., F.L.S., on the subject of "animal intelligence."

A vote of thanks was passed to the lecturer, on the motion of Sir John Lubbock, seconded by Dr. Macdonnell.

Professor Dewar, of Cambridge, gave a lecture in the same place on "Dissociation of Modern Ideas of Chemical Action." Lord Rosse presided. The lecturer met with a cordial reception, and though the majority of the audience had probably little chemical knowledge, he made the discourse intelligible and interesting by a number of experiments. In the course of his address he remarked that cumulative results were often of much greater value than sudden and brilliant discoveries. Black, who died in 1799, was regarded as the father of modern chemistry. He did not call his lectures lectures on chemistry, but lectures on the action of heat and moisture. Chemists were at a loss to know how he laid such a firm basis on principles of inductive philosophy to the science as he dealt with it. But he availed himself of the queries of Sir Isaac Newton, who, although he published nothing directly on chemical science, nevertheless in those queries expressed chemical opinions. Black's great discoveries were connected with the transformation of bodies when they either liquefied or became gaseous, and with the great doctrine of latent heat, according to which a body passing from a solid to a fluid took in heat that was not measureable by the thermometer. At the beginning of the century it was regarded as proved that air was a substance which differed from a fluid in having stored in it in some way a certain quantity of heat. In 1805 Dalton stated he had no doubt that the permanent gases were liquefiable bodies. Twenty years were required before Faraday liquefied any gas. The lecturer by an experiment showed the conversion of carbonic acid gas into a liquid by a pressue of about eighty spheres, with an attendant lowering of temperature. The great importance of the subject called the modern principle of dissociation was the strict parallel that existed between the behaviour of a liquid and a solid with reference to the laws relating to pressure. In Black's time it was disputed among geologists whether water or fire had been the more important agent in geological action. One school, represented by Hutton, supported the doctrine that everything had been done by fire; while another school maintained that water had done everything. The question was raised whether pressure was not an important instrument in the production of chemical change in stratified rocks. A number of experiments on this point had been made by Sir James Hall. The lecturer illustrated the process of decomposition of water by several interesting experiments. It was commonly supposed that a fluid, and a fluid only, boiled, but, as a matter of fact, a solid might boil just the same as a fluid. He gave a very successful experiment with carbonic acid snow, which he reduced to the condition of a small block of ice, placed it in a vessel of ether, and the experiment proved that a continual process of ebullition went on, notwithstanding the fact that the temperature of the block was below that of the Arctic Regions. After several other experiments, each of which was quite successful, he thanked his audience for the attention with which they had listened to him.

Professor Williamson moved a vote of thanks to the lecturer, and paid a high tribute to his abilities.

Dr. Allen Thomson seconded the motion, and congratulated Professor Dewar on his success.

The vote was passed with acclamation.

THE CLOSING MEETING.

The closing meeting was held in the afternoon in the Old Museum, over the entrance gate. President Spottiswoode occupied the chair. There was a crowded audience on the dais, amongst it being the leading men of science who took part in the proceedings.

Captain Galton read a synopsis of grants for scientific purposes.

The President hoped there would be an abundant harvest as the fruits of their labours. A meeting of the magnitude of the present one was quite unparalleled in the history of the Association, and he regarded it as an expression of the interest and goodwill shown by the people of Dublin.

Mr. Griffith announced the result of the sale of tickets—viz., old life members, 201; new life members, 18; old annual members, 290; new annual members, 93; associates, 1285, ladies, 674; foreign members, 17; total, 2578. This was the largest meeting they had ever had. (Applause.)

Dr. Williamson proposed the thanks of the Association to the local authorities who have contributed so much to the success of the meeting and to the enjoyment of the members. It would not be possible for him to do justice to all the gentlemen, even to name all, but he should name some who contributed to its success—in the first place, the Lord Mayor of Dublin, as chairman of the executive committee, and the Provost of Trinity College. (Applause.)

Mr. F. J. Bramwell, F.R.S., in seconding the motion, apologised to Dr. Haughton for having advocated the holding of the meeting in Leeds, for from his long experience of the British Association they never had a more excellent or enjoyable meeting in every way than the present. (Applause.)

The Lord Mayor, the Provost of Trinity College, Professor Ball, and Mr. Norwood returned thanks.

Mr. Gladstone proposed, and Professor Evans seconded, a vote of thanks to the evening lecturers, Professor Romanes and Professor Dewar.

Professor Romanes, in expressing his acknowledgments, said the sooner theology recognised what had already been recognised by philosophy the better for theology.

Dr. Ingram proposed a vote of thanks to the Press.

Lord O'Hagan proposed a vote of thanks to the President, whose address he spoke of in the highest terms.

Sir W. Thomson seconded the vote.

The President expressed his acknowledgments.

The meeting was then adjourned to the 6th of August, 1879, at Sheffield.

POISONOUS AND NON-POISONOUS PAINTS AND WALL-PAPERS.

By H. C. BARTLETT, Ph.D., F.C.S.

UNTIL the Autumn of last year, I was unable to form any accurate idea of the frequency of cases of severe illness occasioned by poisonous paints and wall papers. I had, it is true, within my own professional experience known of several fearful outbreaks of lead poisoning among the workpeople employed in white lead works, and among painters and others working in an atmosphere heavily laden with the saturnine vapours given off in the process of applying such paint or during its drying. I had also been consulted in a great many instances respecting wall papers which were suspected of being coloured with arsenic, in consequence of illnesses of the type recognised as arising from these sources. But, when I was requested by Mr. Jabez Hogg, the well-known surgeon and microscopist, to furnish some particulars of the more striking cases I have investigated, which are now to be laid before Government, I was astonished to find that during the last eleven years I have traced back no less than one hundred and twenty-three cases of illness, attributable either to the diffusion of carbonate of lead (common white paint), or to arsenical or antimonial colouring matters in paint or on wall papers.

Others have been working in the same field of observation, and of those who have witnessed the danger of permitting the use of poisonous pigments and wall papers, I may mention the testimony of the following eminent medical men, and analytical chemists, and others who have recently protested against the employment of such deleterious substances.

I will first quote Mr. Redgrave, General Inspector of Factories, who gives in his official report "that, notwithstanding notable improvements in manufacture, there are still many grave cases of poisoning with lead." Then come letters from Alfred Swaine Taylor, M.D., F.R.S.,; John Stenhouse, LL.D., F.R.S.,; Edward Sieveking, M.D.; H. E. Roscoe, F.R.S.; G. O. Rees, M.D., F.R.S.; William Ord, M.D.; George Johnson, M.D., F.R.S.; Samuel Habershon, M.D.; J. F. Hodges, M.D., F.C.S.; Charles Heisch, F.C.S.; August Dupré, Ph.D., F.R.S.; Langdon Down, M.D.; T. K. Chambers, M.D.; T. Lauder Brunton, M.D., F.R.S.; and Mr. Jabez Hogg. All these scientific authorities of the highest standing give unimpeachable evidence of the wide-spread and often unsuspected existence of these poisons, and of the terrible effects they so often produce without the true cause being discovered in the majority of instances.

Dr. Sieveking endorses the importance of addressing a memorial to be brought before Parliament as to the broad question relating to the employment of poisons in the manufacture of articles intended for domestic use, rather than to limit its scope to the wall papers and dress fabrics dyed with arsenical colours. He proceeds :—"I am afraid that various poisons, arsenical, cupreous, saturnine, and antimoniacal, are employed in trades producing substances used for food and clothing, and if a great effort has to be made, it appears to me better to include all deleterious agents."

With such expressions of the conviction, which nothing but the actual experience of the evil could bring to so many minds, I must be for the present content; merely mentioning that a large number of references to the dangers complained of may be found in Parke's Hygiene, and Woodman and Tidy's Handy Book of Forensic Medicine.

Perhaps, less trouble will be found in procuring an absolute prohibition against the use of arsenical pigments than we can hope to obtain by parliamentary enactment against other poisonous paints. But this should only render the necessity the more apparent that the widest possible publicity should be given to the direful effects of all domestic poisons, and also to point out how they can be avoided.

Supposing arsenic to be abolished from all dress fabrics, curtains, and paper hangings, it will only require one more step in advance to banish salts of copper, lead, and antimony, from the matters with which these materials are dyed or coloured.

We have still the Schweinfurth green paint, almost universally applied to the ordinary green Venetian blinds, which dries in the sun, until clouds of arsenical dust are thrown off every time the blinds are sharply pulled up or let down. And we have, worse than all, the poisonous white lead pigments, which have more to answer for in the total category of ailments which afflict civilized humanity, than has ever yet been appreciated.

In previous papers, I have quoted the dismal train of painful symptoms, induced by being subjected to an atmosphere impregnated with the emanations from salts of lead. I have given the reports of the medical officers of some of our largest Government Dockyards, and I have adduced official testimony as to the deadly nature of the injury to constitution which follows upon a lengthened exposure to this pernicious influence. I will now suggest that for the interior of dwellings, no more white lead shall be used as the basis of oil paint.

The only substitute for white lead until lately offered has been zinc oxide. Many technical objections have been taken to its use. Amongst the rest, its want of body, and poverty of covering, have rendered the oxide of zinc white expensive in requiring several more coats to be laid on than are necessary with white lead paint.

The fine brilliant white and unchangeable permanence of this preparation, together with the non-poisonous character it has borne, have conduced to procure for it a good reputation, notwithstanding the expense of its application, and other defects. The same difficulty has been found in attempting to work up some of the beautiful chemical combinations of silicic acid with zinc calcium, and magnesium, which have also the pearly whiteness of zinc oxide, and with an even more decided want of opacity when mixed with a sufficiency of oil.

I must here mention a peculiarity in the paint, formed by grinding white lead in oil, which affords the first temptation to its most detrimental use. I allude to the fact, not so well-known as it ought to be, that carbonate of lead always contains a certain proportion of lead oxide. This forms a true soap with the oil, combining with the latter, and giving for a considerable period a fictitious body which makes it appear to completely cover a larger surface than it is really competent to effect.

Now, soap is not formed without a partial hydration of the oil, and a small increment of the elements of water thus worked up with the paint, emulsify another portion of the oil in which the lead carbonate is ground. How long it takes to work out of the paint, and to evaporate when thinly spread on hard surfaces, has not yet been ascertained, but for a long time after the paint has become apparently dry this process undoubtedly continues. As affording some indication by which to judge when this drying-out has terminated, I may remark that by the time the oleic acid has driven out its equivalent of the carbonic acid from the lead carbonate, and recombined as oleate of lead, there is no longer that density of covering body, and the coating becomes so much thinner and less opaque as to allow whatever was underneath to dimly appear through it. During this giving off of matters which impregnates the surrounding air, we have a right to assume by experience, that an injurious influence is exercised on the health of those affected by it.

Working with a view to produce a substitute which shall be harmless in its preparation, application, and throughout its use, several chemists of repute have pushed forward their experiments with other salts of zinc. It was left, however, to Mr. Thomas Griffiths, of the Silicate Paint Company, Liverpool, to bring out a satisfactory commercial article, which, while it obviates all the objections urged against oxide of zinc paint by the painters and decorators, complies with the sanitary condition of being perfectly free from poisonous effects upon the workmen who prepare it, the painters who apply it, and upon the people who reside where it is used.

I have reason to believe that other persons have thought of pure sulphide of zinc as being probably the best suited to form the dense white basis of our domestic oil paints. But the natural sulphide of zinc (blend) is commonly rather translucent, and varies in colour from a dingy white to a stone-colour, shading off to a reddish-brown, sometimes appearing opaque with yellow, green, or black tinges—not very encouraging to the paint manufacturer. The excellence of the chemically-pure white sulphide, however, induced a lengthened series of experiments to be tried to carry out artificially the chemical process of making zinc sulphide of the purest white, and, as I shall explain, with almost unexpected success.

My investigation of zinc sulphide, or rather of the oxy-sulphide, to render nomenclature more accurate, has been mainly undertaken with sanitary objects in view. I find that its physiological effect upon animal and vegetable tissues is decidedly antiseptic. It has, therefore, a highly preservative action in protecting wood, &c., from decay, and it unites with the fibres with which it comes in contact, forming permanent bodies with them.

The peculiarly small affinity which zinc has for combining with carbonic acid prevents, to a great extent, the formation of carbonates, and also arrests the saponification of the oil long before the reactions I have described as occurring with carbonate of lead can take place. This is an invaluable property in its application to iron and other metals.

In my report upon the effect of lead paint upon the Italian iron-clads, I was able to demonstrate that a sufficient amount of galvanic action takes place between the salts of lead and the iron to prevent such paint affording a good protection against the corrosion of sea water. In the same way, out-door iron work, as we all know, throws off ordinary paints in flakes or scales by the rusting of the iron underneath. This is not the case with the new zinc paint, which withstands chlorides of all kinds, including sea water. It is not affected with sulphurous acid, sulphuretted hydrogen, or ammoniacal gases, and may be submitted to a great heat without blistering off the iron, as lead paints invariably do at temperatures more than 300° lower than that to which I subjected the new zinc paint. The preservation of iron can thus be better secured than by any other material with which I am acquainted, particularly as oxygen does not penetrate a proper coating of zinc sulphide, and rust cannot form.

In suggesting that white lead paints should be banished from the category of those permissible for use in the interior of our dwellings, I have thought I should do more to accomplish that most desired result by describing the new zinc paint, than by harrowing the feelings of my readers in the endeavour to adequately represent the nature of the evils attendant upon the paints now in vogue.

I have only to add that the new paint is at least as economical as lead, is as dense, and covers even a larger surface; and being of a more perfect snow-white than any lead pigment, it will remain for years unchanged in colour. No fear need now be entertained of severe illness from a newly painted house. No need to postpone the evil day when the painters take possession of our domiciles, on the ground that some one of the family is very susceptible for a long time to the bad influence of paint.

No occasion can be made to atttach an undue importance to a comparatively new invention. But if a few thousand painters and paint-grinders can be saved from the tortures inflicted by the use of white lead, and a few more thousands are prevented from experiencing the lesser nausea and other recognisable consequences of breathing a lead-laden atmosphere, oxy-sulphide of zinc will not have been introduced as a domestic paint in vain. [Paper read at Social Science Congress, Cheltenham.]

WAX-PRODUCING PLANTS.

In a memoir on the cow tree, recently presented to the French Academy by M. Boussingault, the author recommends the cultivation of this tree for the sake of its wax, which he believes may form a valuable substitute for beeswax for various industrial purposes.

Bees, in preparing wax, merely gather it from plants, the majority of which secrete this substance, some of them in such large quantities as to form important objects of commerce. Certain palm trees, some plants belonging to the families of *Myricaceæ*, *Artocarps*, *Terebinths*, and even some *Cucurbits*, are worked for the sake of the wax which can be gathered from them. Undoubtedly the product thus obtained is not as pure as beeswax, but then it is cheaper; and so, if it were for no other purpose, it would still be gathered for adulterating the latter. "Humboldt's palm wax," *Cera de palma*, is at once the commonest and best of the vegetable waxes. It exudes naturally from the bark of a New Granada palm (*Ceroxylon audicola*). The average yield is 25 lbs. to a tree. It forms a considerable article of commerce among the natives. There is also a palm (*Copernicia cerifera*) which yields the "Carnauba wax." The tree, 30 to 40 feet high, is a native of Brazil. The wax is found as a coating on the foliage, and is obtained by shaking the detached leaves so as to loosen the wax. Each leaf furnishes about fifty grains of a scaly whitish powder, which is melted in pots and then run into cakes. It is used to adulterate beeswax. A number of the plants of the genus *Myrica* yield a wax known as "Candleberry or myrtle wax. These plants are mostly shrubs with fragrant foliage, scattered over the temperate regions of both hemispheres. The fruits are nuts or drupes, covered with a coating of a waxy, resinous secretion, which is separated from the berries by boiling them in water and then straining the wax, which appears on the surface, through coarse cloth. Of the North American species, *Myrica cerifera* and *M. Carolinensis*, the latter is said to be the more valuable, giving wax of a greenish-yellow colour, of a finer consistence than the beeswax, and yielding at the rate of one pound of wax to four pounds of berries. Candles manufactured from it diffuse a delightful odour when burning. There are several species of *Myrica* indigenous to Southern Africa, the wax from which is an article of commerce. *Myrica faga*, a native of the Azores, furnishes a wax frequently used in candle-making. Other species, such as *M. sapida*, of China, *M. cordifolia*, and *M. quercifolia*, of the Cape of Good Hope, also yield valuable wax.

A hard white wax, now a considerable article of export from Japan, under the name "Japan wax," is the product of the fruit *Rhus succedanea*, a small tree cultivated in Japan for this purpose. It is exported in square blocks, averaging 130 lbs. each. Candles are commonly made from it by the Japanese. "Peetha wax" is a secretion resembling the bloom or plums, &c., found on the surface of the fruit of the white gourd of India (*Benincasa cerifera*), of the family of *Cucurbits*. It is stated that the dwarf birch (*Betula nana*) yields a wax similar to that afforded by the *Myrica*, and is used for like purposes. The vegetable wax of Sumatra, or wax of Geta- (or Gutta-) Lahoë, is the product of a species of fig (*Ficus cerifera*), and is used for making candles. The wax tree of the Cordilleras (*Elægia utilis*) is remarkable for the quantity of green resinous or waxy matter secreted by the stipules which invest the unexpanded buds. The wax is collected by the Indians and used to varnish useful and ornamental objects. It would require a volume to pass in review all the plants which afford wax, but those that we have just mentioned embrace those that are best known and most utilized as producers of this valuable article.

A CURIOUS ASTRONOMICAL OBSERVATION.

Mr. John H. Eadie, of Green Ridge, Staten Island, N. Y., thus writes to the *Scientific American*:—"While observing Jupiter on the evening of the 28th September, at about 8.30 o'clock, with a small telescope of 3 inches aperture, power 150, I noticed a black spot, round and distinct, on the northerly dark central band. It was about the size of the largest satellite, but as the four satellites were all visible at the same time, two to the east and two to the west of the planet, it did not seem possible to be the shadow of any of them, particularly as no transit was noted for that evening in your 'Astronomical Notes.' I am no astronomer, but take a great deal of pleasure in observing the heavenly bodies, and would be much obliged if any of your readers could afford me some explanation of what seemed to me a singular phenomenon."

SAFETY IN MINES.

A Prussian mining engineer of twenty years' practical employment in coal mines, claims to have discovered a means by which, in every degree of development of fire damp, an explosion can be prevented, and offers it to any state, or to the owners of coal mines in any state, on consideration that a honorarium shall be guaranteed in proportion to the importance of the invention, such remuneration not to be paid until the practical value of the invention is demonstrated.

The inventions of Davy, Stephenson, and others—the safety lamp—render it possible, under necessary precautions, to enter under ground places filled with explosive fire damp, yet the accidents caused by fire damp explosions are even now so frequent as to prove that descending into coal mines wherein fire damp is generated is still connected with great peril.

The value of any invention by which this danger can be completely avoided can hardly be estimated.

SOLIDIFICATION OF PETROLEUM.

A very curious effect is produced on the oils of petroleum, even those of the least gravity, by the addition of powdered soapwort (*Saponaria*), a herbaceous plant of the order Caryophyllaceæ. On digesting the powder with water and mixing it with the oil, the latter forms a very thick mucilage, so that the vessel in which the experiment is made can be turned upside down without spilling the contents. What is still singular is, that if a few drops of carbolic acid be added, and the mucilage shaken, it becomes in a few minutes perfectly limpid again.—*Les Mondes.*

HYMETTUS

TO

I. G. R.

Last eve I sipped the honey which of old
Inspired the gods in an immortal tongue!
Where woke the music of the spheres among
The hills of Attica; whose scenes unfold
A flood of light o'er fields of living gold;
And breathe, as mystic incense moves along,
Or notes, which murmur into some sweet song—
Where fair skies meet, as if the earth to fold.
As steals the honey on the gentler sense,
So pants the soul upon her heavenly course;
Till burning with the Muse, and love intense,
Th' immortal fire distils the sacred source:
Which, to the lips, more choice than *nectar* wine,
Thrills into melody the song divine!

Henry George Hellon.

The Graphone and the Microphone.—The marvels of Prof. Hughes' microphone and Mr. Edison's carbon transmitter have given a fresh impetus in America to the experiments of amateur telephonists, and at the United States Mint, Mr. A. E. Outerbridge, one of the chemists in the assay laboratory, has been very successful in his demonstrations. By the use of the microphone, the tinkle of the new silver dollars falling from the coining press was distinctly heard at the distance of several hundred feet through the closed doors. It may be a surprise to any one but an electrician to be informed that these marvellous effects are transmitted by a wire nearly as fine as a human hair—one-hundredth of an inch in diameter, by actual measurement—and this fine line would doubtless suffice for a great distance. The assayer takes this opportunity of suggesting to Mr. Edison, and the public at large, that the word "phonograph" was long ago appropriated to another science, as the dictionaries prove. "Graphone" would express the right idea, being taken from the two Greek words conveying the same sense; it also eliminates a "ph," one being enough, and it neatly harmonised with telephone, microphone, and similar words.

RECENT AMERICAN AND FOREIGN PATENTS.

Mr. Albert J. Alley, of Fond du Lac, Wis., has patented an improved Stump Machine, Grubber, or Capstan Power for pulling stumps and grubs, for moving buildings, and for other similar uses.

Mr. Fredric W. Degen, of New Athens, Ill., has patented an improved Sulky Cultivator, which is simple, easily guided and controlled, of light draught, and readily adjusted to work closer to or further from the plants, as may be required.

Mr. Charles Friedeborn, of Clare, Mich., has patented an improved Churn Dasher, which consists in an obtusely conical plate of tinned iron, having an axial tube or socket for attaching the handle, and an inverted central inner cone for scattering the cream, and covered at intervals with radial semicircular tubes, which are tapering toward the central socket, and provided with side apertures, the cone being perforated underneath and between the tubes.

Mr. Archibald T. Clark, of Manchester, N.C., has patented an improvement in Farmer's Tools and Handles. The object of this invention is to furnish to farmers, or others that use tools for working in the soil, sets of tools, such as hoes rakes, brier hooks, pitchforks, &c., with a handle adapted for application to any one tool of the set, and which may be readily removed from one tool and applied to another, thereby saving the expense of a separate handle for each tool.

An improved Sulky Plough has been patented by Mr. Dennis W. Palmer, of Detroit, Me. The object of this invention is to furnish an improved device for suspending and managing a sulky plough, so that a farmer can attach and use any plough of his choice, and hitch the team to the beam of the same in the usual way as if the plough were not attached to a vehicle, and can rise and lower the plow out of and into the ground and give it any pitch desired.

Mr. George L. Rider, of Kent, Iowa, has devised an improved Check Row Attachment for any ordinary corn planter. It is so constructed as to be practically unaffected by changes of the weather; it is simple, strong, and inexpensive in manufacture.

Mr. Hiram Snider, of Plattsville, Ontario, Canada, has devised an improved Automatic Weighing Apparatus, which may be attached to the delivery spouts of flour mills, for the purpose of weighing the grain, flour, bran, and other products as they are delivered, and registering the weight. By this apparatus the gross product of a quantity of grain when ground may be ascertained, or the weight of the flour, bran, and middlings may be found separately, and a miller can ascertain, without trouble, the exact yield of a given quantity of grain.

Mr. Hermann Lingen, of Wheeling, W. Va., has patented an improved Measuring Jacket, which is similar in form to the body of a frock coat, having its seams united by elastic cords, to permit them to open more or less to allow the jacket to conform itself to the shape of the body of the person being measured. The elastic seam lacing cords are provided with hooks, which may be adjusted from one eyelet to another. Flaps are placed behind the seams to receive chalk marks, and the jacket is provided with suitable pads.

Messrs. Joseph W. Trudell and Louis S. Trudell, of Sioux City, Iowa, have patented an improved Coupling for connecting the parts of the front gear of a wagon in such a way that they may play easily upon each other, and at the same time may be held securely in place.

Mr. Thomas Stumm, of Ada, Ohio, has patented an improved Washing Machine. This invention relates to certain improvements in that class of washing machines covered by letters patent granted to the same inventor May 5, 1874, No. 150,494, and February 16, 1875, No. 159,855.

An improved Ear Ring Cover has been patented by Mr. Anthony Hessels, of New York City. This invention refers to improvements in that class of ear rings in which an outer shell or covering is used to inclose a diamond or other valuable stone whenever it is not desired to expose the same to view. It consists of a cover or shell having a bottom opening for inserting the diamond or other stone, a slit extending from the opening to the top or apex of the shell, and a gravity drop plate at the inside for closing the bottom opening of the shell.

An improved Ore Separator has been patented by Mr. Emory B. Hastings, of Palmer, Mass. The object of this invention is to furnish a machine for separating ores, or similar uses, for treating finer and coarser particles with the same facility. It may be easily adjusted to operate upon different grades, is simple in construction, and easily operated.

Mr. Theodore Miner, of Brooklyn, N.Y., has devised an improved Carbureter, which feeds the naphtha automatically to the carburetting chambers as it may be required, and will introduce the gas into the warmer part of the curbureting chambers and withdraw it from the colder part.

Mr. Daniel K. Wertman, of Mount Carmel, Pa., has patented an improved Harness, which consists in a novel arrangement of thill straps, a hip strap, and a pad, whereby the weight and pressure distributed more uniformly over the body of the horse, and greater freedom of motion is permitted than by the employment of the breeching heretofore in common use.

Mr. Thomas C. Smith, of Greenpoint, N.Y., has devised an improved Ice Pitcher, which is so made that as large a piece of ice can pass in through its mouth as its body will hold, and it is provided with a device which will prevent the ice from being poured out with the water.

Mr. Joseph M. Kurtz, of Weston, Mo., has recently patented an improvement in Glazier's Square and Rule. This invention consists in a rule having inches and parts of inches marked upon it, and provided with an arm at a right angle, to form a square. The rule or base has an extension slide at one end, which may be clamped in position, and it is also provided with a movable guide, which may be clamped at any point on the rule, and forms a top for the glass, while the arm of the square serves as a straight edge along which the cut is made.

Mr. John W. Donnel, of Muscatine, Iowa, has patented an improved millstone driver, in which the driving points and the point of suspension are in the same plane and parallel with the face of the runner. By this construction the extra pressure on the skirt of the stone is avoided. The driving block is supported on the shoulder of the spindle a sufficient distance below the cockeye, so that it may vibrate and balance itself easily.

Mr. Ramon Verea, of New York City, has patented an improved calculating machine. This ingenious machine is capable of rapidly performing addition, subtraction, multiplication, and division. The details of its construction cannot be properly described without engravings.

Mr. William Booth, of Newark, N. J., has patented an improved machine for rounding off the ends of fine combs, such as are made of celluloid, hard rubber, and other material, the machine being adapted for cutting different sizes of combs, and accomplishing its work rapidly and accurately.

Mr. William H. Peterson, of Richmond, Ind., has patented an improved double acting force pump, that is of simple and compact form, and adapted to be placed at any depth in the well, so as to make it non-freezing.

An improvement in machines for cleaning and polishing coffee has been patended by Mr. Henry Bamberger, of Philadelphia, Pa. This invention has reference to an improved machine for cleaning coffee of its adhering impurities, dry hulls, &c., and imparting to it a smooth and uniform appearance.

Mr. Willie Kniffin, of Yorktown, N. Y., has patented an improved lifting jack for raising the axles of waggons to allow their wheels to be removed, and to raise other heavy weights. It is so constructed as to enable a weight to be raised by a slight exertion, and will hold the weight suspended for any length of time.

Mr. William H. Walsh, of Fort Worth, Texas, has devised an improved gin saw sharpener, of simple construction, by which the teeth of the saws are cut square at the inside and pointed at the top, and by which the sharpening of all the saws of a cylinder is accomplished quickly and perfectly, avoiding the objectionable features of hand sharpening.

An ingenious mechanical arrangement of an automatic inking device is embodied in a new printing press patented by Mr. Edward L. Gilman, of Somerville, Mass., and especially adapted to the use of amateurs and job printers. The same motion which carries forward the ink roller throws forward an arm which strikes a stud and releases the paper.

An improved gin saw filer, devised by Mr. Edward L. Harris, of Red Banks, Miss., has devices for reciprocating the file and rotating the saw. The novel features are embodied in the carriage which supports the file carrying mechanism. Ingenious means are provided for varying the angle of the teeth.

Mr. Adolphus H. Vitt, of Union, Mo., has patented a new piston rod packing, which consists of recessed sectional shells and sectional brass rings arranged therein in combination with retaining springs and sleeve and end rings. This packing is claimed not to heat or abrade and to require but little lubrication.

Messrs. Joseph F. Wooldridge, Johan F. Nystran, and Lyman D. Howard, of Richmond, Va., have patented a new lump tobacco machine, for giving an initial pressure to the filler of the plug before the binder is put on, and for discharging said lumps continuously and consecutively without loosening, breaking, or destroying in any way the integrity of the material.

Mr. Wm. S. Hull, of Hinds Co., Miss., has recently patented a new screw propeller, which is an improvement upon the screw propeller for which letters patent were granted the same inventor February 20, 1877. Said improvement chiefly consists in giving to the leading edge of the right angled triangular blade a finer pitch, or smaller angle to the plane of rotation of the blades than the pitch or angle of the rear portion of the blade.

Mr. Thomas L. Lee, of Paducah, M'Cracken Co., Ky., has patented a new dredging machine, the new feature in which is the particular construction of the dredging cylinder, which has a body made in the form of an elongated shell, with longitudinal blades arranged upon the periphery of the same so as to operate laterally upon the mud and sand, thus beating the same so as to uniformly impregnate the water with it.

Mr. Wm. H. Phelps, of Greenville, Meriwether Co., Ga., has patented a new horse power, in which the object aimed at is to attain maximum speed and power with a minimum length of sweep or lever. To this end, the inventor adopts a novel combination of gears.

Mr. David Gates, of Benwood, Marshall Co., W. Va., has patented a novel drag sawing machine, which saws logs and timber into sections. A horse power gearing is attached to a wheeled frame, and the saw is detachably connected with a reciprocating cross head by means of a bolt and clevis. The saw is guided in its movement by a bar which is attached to the log.

Mr. Aaron J. Mershon, of Warshaw, Ind., has patented an improved Rock Drilling Machine. This invention relates to certain improvements on the rock drilling machine for which letters patent No. 190,232 were granted to the same inventor May 1, 1877; and it consists in combining with the drill shaft, its lifting arm and the slotted dish wheel, an arm and springs, whereby greater force is applied to the drill on its descending stroke.

Mr. James K. Johnson, of St. Louis, Mo., has patented an improved Burglar Alarm. This invention is an improvement upon the device for which letters patent No. 192,698, dated July 8, 1877, have been issued to the same inventor. The object is to provide a stronger, more compact, and also more efficient device.

Mr. Joseph Forman, of Helena Ky., has patented an improved Car Coupling, which consists of a lever arrangement for raising and dropping the coupling pin from the side or top of the car; and in a swinging and guided frame for lifting the coupling link from the top or side of the car, so that it properly enters the mouth of the connecting draw head.

An improved Razor Strop has been patented by Mr. George W. Brown, of Cumberland Mills (Westbrook), Me. This invention relates to that class of razor strops that are coiled within a case by the action of a spring, and it consists in arranging a spring roll and friction roll with respect to each other, and to an opening in the case, so that the working face of the strop cannot come in contact with the surface of either roll.

Mr. Perry Dickson, of Spearfish City, Dakota Territory, has patented an improved Irrigating Apparatus, by which the water may be distributed at any degree of temperature over the ground, either for the purpose of melting the snow and taking the frost out of the ground, or for scalding the seeds of weeds and killing worms, grasshopper eggs, and other insects, or for accelerating the growth of the plants, when the ground is prepared, by distributing water in a warm state during the cold nights, so as to supply a sufficient degree of heat to the ground, whereby the growing of the vegetables and other plants is accelerated in a high degree.

An improved Brake for Railway Cars has been patented by Mr. Willard R. Green, of Muscatine, Iowa. This invention consists in a novel arrangement of coupling mechanism, connecting rods, and various other devices, in connection with the brake mechanism, whereby provision is made for operating the brakes of all the cars in a train by power applied from the engine.

Mr. Richard Pattin, of Marietta, Ohio, has patented an improved Breast Collar, which is so constructed as to work easier upon the horse than breast collars constructed in the usual way, and which may be placed higher up, so as to be in the most favourable position for the horse to apply his strength to the draught.

Mr. S. Hinckson Bradford, of New York City, has patented an improved Tin Can for condensed milk, paints, and other articles. It has the advantage of being provided with a hinged lid, so that the lid may be raised or lowered with great facility and the contents of the can protected effectively against dust and flies.

Mr. Miles Puckett, of Walesca, Ga., has patented an improved Washing Machine, which is simple in construction, convenient, and effective. It will wash the clothes without injuring them, and with a comparatively small amount of labour.

Mr. Benjamin F. Buxton, of Brookfield, Vt., has patented an improved apparatus by which moist rubber and other boots, shoes, mittens, and similar articles may be dried perfectly, without any objectionable odour in the room. It consists of a box having a draught tube connected to the chimney and bottom tubes with lower perforated elbows, adjustable end pieces, and suspension devices for the boots or shoes, so that the draught established at the interior draws off the moisture and odour.

Mr. Joseph W. Blosser, of Sarcoxie, Mo., has patented an effective Catarrh Remedy, to be utilised either in the form of small cakes by chewing, or in the form of medicated fumes by smoking it like tobacco in a pipe or cigarrette, and inhaling, swallowing, or blowing out the smoke through the nostrils, or as the state and location of the disease may require.

An improved Horse Collar has been patented by Mr. Andrew D. Martin, of Abbeville, La. This collar has been made by winding moss, hemp, flax, or cotton twine or cord around a flexible base, such as rope, until it is of the proper shape and proportions for a horse collar, when the rope is bent around to the required oval shape and the ends secured. The shoulder for the hames is formed by winding twine evenly upon a base similar to the collar, but smaller, and attaching the rope thus wound to the inner edge of the main collar.

Messrs. Loren M. Webb and Edwin Tinker, of Tuscarora, N.Y., have patented an improved Car Coupling, in which the coupling pin is guided in a cylindrical pin guide or barrel at the top of the draw head, and supported by an extension of the sliding front plate until the same is pushed back by the link. Transverse ribs at the face of the front slide plate serve to hold the link in position for coupling, while a hand lever that engages one of the slide plates sets the ribbed front plate backward or forward on the centre guide block.

Mr. Joseph Adams, of Washington, D.C., has patented an improvement in Gas Regulators designed to increase, diminish, or entirely cut off the supply of gas in an automatic regulator from any portion of the building, and without descending to the meter or place where the regulator is, and designed also to obviate leakage of gas in the regulator.

THE ABSORPTION AND EXCRETION OF WATER.

THE absorption of water from the alimentary tract is a subject to which less attention has been directed than its practical importance deserves, for the subject is not so simple as might at first sight appear. Dr. Skorczewski, of Cracow, has, says the *Lancet*, made an interesting series of observations on the relation in time and quality between the absorption of water and the excretion of urine, and his results have been published in a Warsaw journal. The observations were made upon men and rabbits, and in the latter provision was made to secure the urine as soon as it passed into the bladder. Spring, soda water, and certain Russian mineral waters (those of Krynica and Iwonicz) were employed in the observations. The following conclusions were reached. After the injection of spring water the quantity of urine did not increase immediately, in the case of either men or rabbits, but rose after a certain time, which is said to have been the longer the more water was taken. A longer period elapsed after the spring water than after the mineral water before the increase in the urinary secretion occurred; and the more spring water was taken the longer was this interval, and the more mineral water the shorter was the interval. The increase in the urinary secretion reached its height sooner after the mineral water than after spring water. The greatest total effect on the urinary section was obtained by soda water, the next with spring water, and the least with the mineral waters. The quantity of urine was in each case smaller than the quantity of water ingested, with the exception of that which was saturated with carbonic acid. The difference between the total quantity of urine excreted was less after ordinary spring water than after the mineral water.

A second series of observations had for their object to ascertain the relation in time and quality between the water absorbed and urine excreted. This was effected by killing rabbits at certain periods after the water was injected into the stomach, the excretion of urine becoming observed in the same way way as before. From these observations it appeared that the increase in the excretion of urine did not commence until after the whole of the water had been absorbed, and in the case of both small and moderate quantities of water (40 to 100 c.c.m.) a period of ten or fifteen minutes passed after all the water had been absorbed before the effect on the urine was apparent. It calculated that 500 cubic centimetres of water is absorbed from the human stomach in fifteen minutes, and 200 c.c.m. in five minutes. The results are true, however, only of spring water. Mineral water behaves differently. The increase in the excretion of urine occurs the earlier the slower the absorption progress. By the exclusion of certain possible causes for this difference, such as altered pressure in the abdominal cavity, direct irritation of the splanchnic nerve, or the effect of blood tension, the conclusion is reached that the cause is the alteration in the blood consequent on the admixture with it of the saline substances in the mineral waters, the change in the blood acting as a stimulant to the vaso-motor nerves.

Whatever be the precise value of these researches, they show conclusively that the function of the stomach and kidneys may be materially affected by the presence of very small quantities of saline substances, and they indicate how much caution is necessary in applying rules true of pure water to water which are accustomed to consider as differing from spring water by very trifling quantities. As an instance of the practical importance of these facts, it is evident that the saline waters, so commonly taken with food, remain in the alimentary canal for a much longer time than spring water, and are capable, therefore, of distributing in a great degree the process of digestion.

GASLIGHT AND DEFECTIVE SIGHT.—The German Minister of Instruction, as the result of frequent conferences with well-known physicians, reports that no evil effects follow a moderate use of gas, if the direct action of the yellow flame on the eye is prevented. For this purpose screens or shades are employed. Very grave objections, however, exist to the use of zinc or lead shades, most evils affecting the eyes being traceable to them. Their use, it is said, inevitably tends to blindness or inflammation and other harmful effects. The milky-white glass shade is the best, as it distributes the light and has a grateful effect on the eye. The burner should not be too close to the head, as congestions of the forehead and headaches result from the radiated heat. The glass plate below the gas, employed in some places, is especially useful for the purpose, as it causes an equal distribution of the light —necessary where a number are working at one burner—prevents the radiation of heat and tends to a steady illumination by shielding the flames from currents of air. In cases of highly-inflamed eyes, dark blue globes can be very beneficially employed With precautions of this kind, no evil effects from the burning of gas need be feared.

THE INVENTORS' INSTITUTE

ESTABLISHED 1st MAY, 1862.

FORTNIGHTLY MEETINGS, DURING SESSION,

HELD (NOVEMBER TO MAY INCLUSIVE) AT

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, W.C.

PAST PRESIDENT—SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the Establishment of the INVENTORS' INSTITUTE till his decease, February, 1868.

PAST PRESIDENT—LORD RICHARD GROSVENOR, M.P., &c., from February, 1868, till May, 1871.

Council:

PRESIDENT OF THE INSTITUTE,

SIR ANTONIO BRADY.

The Right Hon. The Earl of Caithness, Vice-Pres.
*Sir Thomas Fairbairn, Bart., Vice-Pres.
*Beresford Hope, Esq., M.P., Vice-Pres.
*His Grace the Duke of Manchester, ice-Pres.
*Robert Richardson, Esq., C.E., Vice-Pres.
*Adml. Jasper Selwyn, R.N., Vice-Pres.
*Sir Fothergill Cooke, Vice-Pres.
*Cromwell F. Varley, Esq., F.R.S., &c., Vice-Pres.
*Henry Bessemer. Esq., Vice-Pres.
*C. Williams Siemens, Esq., C.E., D.C.L., F.R.S., Vice-Pres.
*F. H. Varley, Esq., C E., C.E.C.Inst.
*H. A. Allardyce, Esq.
Allexander Allan, Esq., C.E.
T Aveling, Esq.
P. W. Barlow, Esq., C.E., F.R.S.
*W. H. Barlow. Esq., C.E., F.R.S.
*T. Blanchett, Esq.
M. P. W. Boulton, Esq.
F. Braby, Esq.
*S. Calley, Esq.
*F. W. Campin, Esq., F.R.S.L. (Sec.)
Samuel Chatwood, Esq.
D. K. Clarke, Esq., C.E.
Dr. Robert H. Collyer, F.C S.
W Conisbee, Esq.
Genl. Sir A. Cotton, K.C.S.I., &c.
Samuel Courtauld, Esq.
H.C. Coulthard, Esq., C.E.
A. A. Croll, Esq.
*Dr. J. McGrigor Croft.
Robert Davison Esq., C.E.
William Dempsey, Esq., C.E.
*Captain Fairholme, R.N.
John Farmer, Esq.
J. Faulding, Esq., C.E.
C. Finzel, Esq.
H. A. Fletcher, Esq., C.E., F.R.A.S.
G. W. Hemans, Esq., C.E.
W. T. Henley, Esq.
Alexander Mitchell Innes, Esq.
W. Mitchell Innes, Esq.
Dr. H. C. Jennings.
Dr. P. W. Latham, M.A.
*D. J. McLauchlan, Esq.
Walter Macfarlane, Esq.
John Mackintosh, Esq.
*Thomas Morgan, Esq., A.S.E.
George Frederick Muntz, Esq.
*A. J. Murray, Esq., C.E.
A. Normandy, Esq.
*T. Paterson, Esq.
W. H. Preece, Esq., C.E.
J. L. Pulvermacher, Esq.
T. W. Rammell, Esq.
John Ramsbotton, Esq., C.E.
*Fred. Ransome, Esq., C.E.
John Saxby, Esq.
A. Sedley, Esq.
E. Sonstadt, Esq.
Berger Spence, Esq.
Peter Spence, Esq.
G. P. Tangye, Esq.
Robert Wheble, Esq.
W. N. Wilson, Esq.
*M. Zingler, Esq.

SECRETARY, F. W. CAMPIN, Esq. AUDITORS, J. P. CUTTS, Esq., W. SMARTT, Esq.
The * denotes Members of the Executive Council.

The various efforts which have been made, and the numerous influences now at work to injure, if not destroy, Patent Rights; the inefficiency of the many well-intended, but ill-considered, Schemes of Patent Law Reform, which have from time to time been suggested, and the tendency of which has generally been to prejudice the Inventor without advantage to the Public; together with the proceedings so essentially involving the interests of Inventors which have already taken place in Parliament, as to the propriety of abolishing Patent Rights altogether, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights urgently needed. This Institute has, therefore, been established for the purpose of uniting and organising the influence of Inventors, Patentees, and others. Its objects are:—

1st. To protect Inventors' interests, and defend the privilege of obtaining Her Majesty's Letters-Patent.
2nd. To promote improvements in the Patent Laws.
3rd. To facilitate the diffusion of information with reference to Inventions, and other subjects beneficial to Inventors and Patentees.

The qualification for Annual Members of the Institute is a Yearly Subscription of One Guinea, and for Life Members a single payment of Ten Guineas

Subscriptions are payable to the Receiver, Mr. G. A. STRETTON, 4, *St. Martin's Place, W.C.*

NOTICE TO INTENDING PATENTEES.

THE INVENTORS' PATENTRIGHT ASSOCIATION, LIMITED,

(*The Proprietors of the "Scientific and Literary Review"*),

21, COCKSPUR STREET, CHARING CROSS, LONDON, S.W.,

OBTAIN PATENTS FOR INVENTIONS AT FIXED AND MODERATE CHARGES.

DIRECTORS.
J. E. K. CUTTS, Esq. J. P. CUTTS, Esq.
T. MORGAN, Esq.

STANDING COUNSEL FOR PATENT LAW MATTERS.
F. W. CAMPIN, Esq., Barrister-at-Law, F.R.S.L.

AUDITOR.
RICHARD COCKER, Esq.

BANKERS.
LONDON AND WESTMINSTER BANK, St. James's Square.

SCIENTIFIC REFEREES.
JOHN WOODHOUSE, Esq., C.E., and M.E., &c.
ROBERT RICHARDSON, Esq., C.E., &c.
DR. B. H. PAUL, F.C.S.
ADML. J. H. SELWYN, R.N., &c.
DESMOND GERALD FITZGERALD, Esq., Electrician.

This Association was established in the year 1867, for the purpose of simplifying, cheapening, and expediting as far as possible the proceedings attending THE OBTAINING OF PATENTS FOR INVENTIONS and their commercial development

Several leading members of the Inventors' Institute, coming daily in contact with Inventors, whose wants and difficulties were daily pressed on their attention, formed themselves into this Association, entitled "The Inventors' Patentright Association, Limited," in order to supply Inventors with the best and most reliable information and advice—to provide skilled references on questions of science and manufacture—to render legal processes for protecting and maintaining patent rights safe, cheap, and ready—and to aid Inventors in bringing their inventions into practicable and profitable shape. To carry out these views, the following are the

OBJECTS OF THE ASSOCIATION.

To obtain Patents for Inventions in this and other countries.
To Register Designs.
To aid in forming public Companies, and in Publicly introducing Patented Inventions.
To aid in Selling and Licensing Patented Inventions.
To furnish advice and professional Assistance in developing Inventions.
To collect Evidence, arrange Arbitrations, and otherwise assist Inventors in maintaining their rights.

N.B.—To Members of the Inventors' Institute this Association offers special privileges in the obtaining of Patents both in this country and in all parts of the world.

A Handbook furnished gratis on application to THOMAS MORGAN, Secretary, 21, Cockspur Street, Charing Cross, London.

London: Printed by EDWIN JOHN DAVEY, Boy Court, Ludgate Hill, E.C.; and Published for the Proprietors at 21, Cockspur Street, Charing Cross; and Sold by W. KENT & Co. 23, Paternoster Row, and SAMPSON LOW, SON, & MARSTON, English, American and Colonial Booksellers and Publishers Crown Buildings, 188, Fleet Street, London, E.C

BRITISH MUSEUM 5 DE 78